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[Trade analysis series]  
An Analysis of the plumbing  
trade, 1966.





AN ANALYSIS  
OF THE  
PLUMBING TRADE



PREPARED BY  
A NATIONAL COMMITTEE

APPOINTED BY  
THE DEPARTMENT OF LABOUR  
OTTAWA, CANADA

Revised 1966





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1966



# AN ANALYSIS OF THE PLUMBING TRADE

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- STRUCTURAL STEEL & PLATE ERECTION TRADE •



# AN ANALYSIS OF THE PLUMBING TRADE

## INTRODUCTION

The first National Conference on Apprenticeship in Trades and Industries held in Ottawa in May 1952, recommended that the Federal Government be requested to co-operate with provincial apprenticeship committees and officials in preparing analyses of a number of skilled occupations.

In January 1956, the Vocational Training Branch, Department of Labour, Ottawa, appointed Mr. R. E. Byron, Director of Vocational Education, Edmonton, Alberta, to act as co-ordinator and to select a committee to prepare an Analysis of the Plumbing Trade. This committee consisted of Mr. J. Blight, Chief Inspector of the Gas Board, Mr. A. V. Webber, Apprentice Supervisor for the Alberta Department of Labour and Mr. W. Ottewell, Chief Plumbing Instructor at the Provincial Institute of Trades, Calgary, Alberta.

## REVISION

Early in 1963 the Technical and Vocational Training Branch of the Department of Labour, Ottawa, on the recommendation of the Apprenticeship Training Advisory Committee, decided to undertake a revision of the Plumbing Trade Analysis. A committee selected by the Department of Labour from nominations received from trade, industry and educational officials was appointed to undertake this task. The committee members were: Mr. K. MacLennan, Department Head, Mechanical Building Trades, Provincial Institute of Trades, Toronto, Ontario; Mr. Albert Airey, Plumbing Inspector (Retired); Mr. James Whitehead, Business Representative, United Association, Local 46; and Mr. Donald T. Dingwall, Vocational Co-ordinator, Port Arthur Board of Education. The committee was convened by Mr. Gordon L. Bratt, Training Consultant (Curriculum) and Mr. R.E. Adams, Occupational Analyst, of the Technical and Vocational Training Branch, Department of Labour, Ottawa.

## SCOPE OF THE ANALYSIS

The occupational requirements of the plumbing trade in Canada are rapidly changing to suit the increasing demands of the advances made in this technological era. Development and availability of new materials, together with the regional differences of the Canadian scene, also contribute toward the changing character of this occupation.

In preparing this revised analysis, the national committee has objectively identified the occupational requirements of this trade for the present and foreseeable future. Consideration has also been given to the effects that the variety of plumbing codes and building regulations, which exist from city to city and province to province, will have on the practice of this trade throughout Canada. Furthermore, in many provinces it is a requirement that the journeyman plumber must have additional competency in the application and practice of gas fitting and welding to enable him to perform certain functions of these allied trades. Additionally, the plumber will be expected to co-ordinate his activities with those of other associated trades and in emergencies perform some elementary functions of these trades. The national committee also felt that the plumber should have a general knowledge of the requirements of building construction which are essential to the completion and co-ordination of a total project.



This analysis, then, sets forth the knowledge and skills that form the entire background of the Plumbing Trade as it is practised in Canada. This does not, of course, preclude the fact that some elements of the trade may be vastly more important in some provinces or areas than others.

In the preparation of this analysis it was impossible to completely avoid some repetition of knowledge, skill and related mathematics or science, nor is it desirable to do so. Some repetition is necessary to eliminate the need for reference to other parts of the analysis.

It is important to note that some topics have not been dealt with specifically in this analysis although they are considered to be an essential part of the craftsman's practice of his trade. These are cleanliness and orderliness, personal and public safety in the performance of work, good public and customer relations, co-operation with contractor and tradesman, regard for property, respect and consideration for the rights of others and a workmanlike approach to his craft.

As in other trades, the individual's proficiency is directly proportional to his theoretical knowledge and ability to disseminate technical information as well as his manipulative skills and the desire to study in order to keep abreast of new practices in the trade if he desires to become an outstanding tradesman. It is therefore the committee's recommendation that training in this trade should consist of a co-ordinated training of formal classroom instruction and on-the-job training under the direction of competent instructors and qualified tradesmen.

#### PROCEDURE

To ensure that this analysis would be valid in all respects, requests were sent to all provinces for suggestions and criticism of the existing analysis and the results of this survey were turned over to the revision committee for their study.

Each member of the committee undertook the preparation of certain blocks and as the work progressed, these were distributed for criticism to the other members. Subsequently, draft copies were prepared and given wide distribution to Provincial Directors of Apprenticeship, Provincial Directors of Vocational Education, industry and other interested individuals for critical examination.

#### PURPOSE AND USE OF THE ANALYSIS

It should be emphasized that this is not a course of study and it is not intended that operations be mastered in the sequence shown. The analysis is recommended as the basis of instruction in industry and in trade institutes, as a guide to foremen for on-the-job training, and as a basis for evaluating previous experience.

Officials of the Federal Department of Labour desire to express their sincere appreciation to all who contributed to the preparation of this analysis, particularly Mr. Joseph Connolly, General Organizer, United Association, the Port Arthur Board of Education, Mr. Gordon Wragg, Principal of the Provincial Institute of Trades, Toronto, and for the co-operation, interest and help of the Provincial Directors of Apprenticeship, vocational education authorities, the Canadian Construction Association and its members.



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

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### BLOCK 1: Trade Tools

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# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 1: Trade Tools

UNIT 1: Measuring Devices

---

OPERATIONS	KNOWLEDGE
<hr/>	
1. Measuring with a rule and a tape	<ul style="list-style-type: none"><li>(a) Interpretation of drawings to determine:<ul style="list-style-type: none"><li>(i) size dimensions</li><li>(ii) location dimensions</li></ul></li><li>(b) Types and features of rules:<ul style="list-style-type: none"><li>(i) tape</li><li>(ii) folding</li><li>(iii) flexible</li></ul></li><li>(c) Type of rule and tape calibrations:<ul style="list-style-type: none"><li>(i) fractional</li><li>(ii) decimal</li></ul></li><li>(d) Theory of dimensions</li><li>(e) Method of obtaining accurate dimensions with a rule or tape</li><li>(f) Application of accessories used with rules and tapes</li><li>(g) Care and storage of rules and tapes</li><li>(h) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to calculate dimensions</li><li>(ii) conversion of decimal and fractional values</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 1: Measuring Devices

OPERATIONS	KNOWLEDGE
2. Using the builders level	<ul style="list-style-type: none"><li>(a) Type, purpose, and characteristics of levels:<ul style="list-style-type: none"><li>(i) dumpy level</li><li>(ii) construction level</li></ul></li><li>(b) Method of locating and setting-up level</li><li>(c) Importance of setting tripod legs securely</li><li>(d) Procedures for levelling the instrument</li><li>(e) Type, purposes and use of rods</li><li>(f) Methods of reading rods</li><li>(g) Identification of bench-marks and datum points</li><li>(h) Procedures for establishing and recording intermediate levels</li><li>(i) Care and storage of instruments</li><li>(j) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to determine elevations</li><li>(ii) conversion of decimal and fractional values</li></ul></li><li>(k) Science:<ul style="list-style-type: none"><li>(i) elementary Optics</li></ul></li></ul>
3. Measuring with an outside micrometer	<ul style="list-style-type: none"><li>(a) Types and features of outside micrometers:<ul style="list-style-type: none"><li>(i) square anvil</li><li>(ii) round anvil</li></ul></li><li>(b) Micrometer terminology</li><li>(c) Procedure in reading a micrometer in thousandths and tenths</li><li>(d) Importance of 'feel' in accurate measurement</li><li>(e) Methods of holding a micrometer</li><li>(f) Importance of avoiding canting or tipping micrometer when measuring</li><li>(g) Procedures in transferring measurements from inside calipers</li><li>(h) Methods of checking and adjusting micrometers</li><li>(i) Care and storage of micrometers</li><li>(j) Mathematics: conversion of fractional and decimal measurements</li></ul>
	(3)

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 1: Measuring Devices

---

OPERATIONS	KNOWLEDGE
<hr/>	
4. Measuring with squares	<ul style="list-style-type: none"><li>(a) Type, purpose and features of squares:<ul style="list-style-type: none"><li>(i) try-square</li><li>(ii) combination square</li></ul></li><li>(b) Methods of checking squares for accuracy:<ul style="list-style-type: none"><li>(i) master square</li><li>(ii) reversal</li></ul></li><li>(c) Value of back lighting for visually checking squareness</li><li>(d) Procedures when using and/or measuring with squares</li><li>(e) Care and storage of squares and accessories</li><li>(f) Science:<ul style="list-style-type: none"><li>(i) reflection, refraction and transmission of light</li></ul></li></ul>
5. Measuring and checking with straight edges	<ul style="list-style-type: none"><li>(a) Type, purpose and features of straight edges:<ul style="list-style-type: none"><li>(i) fish-back</li><li>(ii) combination</li></ul></li><li>(b) Accessories used with straight-edges:<ul style="list-style-type: none"><li>(i) surface plates</li><li>(ii) levels</li></ul></li><li>(c) Methods of checking flat surfaces with straight-edges using:<ul style="list-style-type: none"><li>(i) marking</li><li>(ii) light</li></ul></li><li>(d) Types and use of marking compounds:<ul style="list-style-type: none"><li>(i) Prussian blue</li><li>(ii) red lead</li><li>(iii) lamp-black</li><li>(iv) other</li></ul></li><li>(e) Care required in handling straight-edges</li><li>(f) Care and storage of straight-edges</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 1: Measuring Devices

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OPERATIONS	KNOWLEDGE
<hr/>	
6. Selecting and using hand levels and plumb bobs	(a) Type, purpose and use of hand levels: (i) spirit (ii) manometer (b) Type, purpose and characteristics of plumb bobs (c) Method of checking levels for accuracy (d) Procedure for levelling and "Plumbing" (e) Care and storage of levels and plumb bobs (f) Science: (i) law of gravity (ii) equilibrium of fluids

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 2: Non-cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Selecting hammers	<ul style="list-style-type: none"><li>(a) Types, features and uses of hammers:<ul style="list-style-type: none"><li>(i) ball-peen</li><li>(ii) cross-peen</li><li>(iii) straight-peen</li><li>(iv) planishing</li><li>(v) sledge</li><li>(vi) claw</li></ul></li><li>(b) Sizes and weights of hammers</li><li>(c) Balance of hammers</li><li>(d) Materials for hammers:<ul style="list-style-type: none"><li>(i) steel, various grades</li><li>(ii) brass</li><li>(iii) lead</li><li>(iv) rawhide</li><li>(v) non-sparking alloys</li><li>(vi) combination, metal heads with removable inserts of plastic, fibre, soft-metal</li></ul></li><li>(e) Correct shape and finish of hammer face</li><li>(f) Advantages of soft or non-metallic hammers for certain classes of work:<ul style="list-style-type: none"><li>(i) finished surfaces</li><li>(ii) soft materials</li><li>(iii) hardened or brittle materials</li><li>(iv) thin sections</li></ul></li><li>(g) Science:<ul style="list-style-type: none"><li>(i) strength of materials</li><li>(ii) weights of materials</li><li>(iii) physical properties of metals</li></ul></li></ul>



AN ANALYSIS OF THE PLUMBING TRADE

- TRADE TOOLS AND PROCEDURES -

BLOCK 1: Trade Tools

UNIT 2: Non-cutting Tools

---

OPERATIONS	KNOWLEDGE
<hr/>	
2. Using hammers	<ul style="list-style-type: none"><li>(a) Method of holding hammer</li><li>(b) Correct stance</li><li>(c) Correct wrist and arm action</li><li>(d) Method of striking</li><li>(e) Results of 'choking' the hammer</li><li>(f) Importance of eye protection where conditions warrant</li><li>(g) Procedures in using hammer for:<ul style="list-style-type: none"><li>(i) striking</li><li>(ii) driving</li><li>(iii) tapping</li><li>(iv) forging</li></ul></li><li>(h) Care required when using hammer on hardened materials</li><li>(i) Use of soft faced hammers on finished surfaces</li><li>(j) Results of off-center or out-of-square blows</li><li>(k) Result of striking with grease or oil on work or hammer face</li><li>(l) Procedures for peening and riveting</li><li>(m) Techniques of using hammers and chisels</li><li>(n) Method of delivering 'dead' blows</li><li>(o) Correct type and motion of hammer in planishing</li><li>(p) Methods of finishing hammer face</li><li>(q) Procedures for tightening head on shaft</li><li>(r) Science:<ul style="list-style-type: none"><li>(i) effect of mass and inertia</li><li>(ii) effect of momentum</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 2: Non-cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
3. Selecting and using screwdrivers	<ul style="list-style-type: none"><li>(a) Types, sizes and uses of screwdrivers:<ul style="list-style-type: none"><li>(i) regular</li><li>(ii) ratchet</li><li>(iii) offset</li><li>(iv) spiral</li><li>(v) insulated</li><li>(vi) wedge, clip (screw-holding)</li><li>(vii) magnetic</li><li>(viii) other</li></ul></li><li>(b) Correct method of using screwdrivers</li><li>(c) Importance of proper shape of tip</li><li>(d) Hazards of holding work in hand</li><li>(e) Results of using screwdrivers as drifts or chisels</li><li>(f) Types, applications and uses of various type tips:<ul style="list-style-type: none"><li>(i) hexagonal</li><li>(ii) flat</li><li>(iii) cross</li><li>(iv) square</li><li>(v) other</li></ul></li><li>(g) Colour coding used with screwdrivers</li><li>(h) Use of attachments for holding screws on screwdrivers</li><li>(i) Method of reconditioning screwdriver blades</li><li>(j) Science:<ul style="list-style-type: none"><li>hardening and tempering of steel</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 2: Non-cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
4. Selecting and using wrenches	<ul style="list-style-type: none"><li>(a) Type, purpose, size and characteristics of wrenches</li><li>(b) Identification of wrenches for particular applications</li><li>(c) Importance of correct fit of wrenches on pipes or threaded fasteners</li><li>(d) Selecting and using wrenches:<ul style="list-style-type: none"><li>(i) pipe (external and internal)</li><li>(ii) torque</li><li>(iii) open end</li><li>(iv) socket</li><li>(v) box</li><li>(vi) adjustable</li><li>(vii) torque multipliers</li><li>(viii) other</li></ul></li><li>(e) Results of using incorrect size and type</li><li>(f) Methods of protecting finished surfaces</li><li>(g) Procedures for tightening multi-bolted gasketed covers</li><li>(h) Science:<ul style="list-style-type: none"><li>(i) mechanical</li><li>(ii) principle of levers</li><li>(iii) torque</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Selecting saws	<ul style="list-style-type: none"><li>(a) Types, use and features of saws:<ul style="list-style-type: none"><li>(i) hacksaws, plain and adjustable</li><li>(ii) compass saws</li><li>(iii) coping saws</li><li>(iv) wood cutting saws</li><li>(v) combination</li></ul></li><li>(b) Types, use and size of hacksaw blades:<ul style="list-style-type: none"><li>(i) flexible, edge-hard</li><li>(ii) all-hard</li><li>(iii) alloy, high-speed, cobalt</li><li>(iv) various pitch teeth, fine, medium and coarse</li></ul></li><li>(c) Application and characteristics of wood-cutting saws:<ul style="list-style-type: none"><li>(i) cross-cut</li><li>(ii) rip</li><li>(iii) coping</li><li>(iv) powered handsaws, circular and sabre</li></ul></li><li>(d) Factors determining selection of saw or blade:<ul style="list-style-type: none"><li>(i) type and size of material</li><li>(ii) work to be performed</li></ul></li><li>(e) Handsaw nomenclature</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

OPERATIONS	KNOWLEDGE
2. Sawing - metal	<ul style="list-style-type: none"><li>(a) Methods of holding and supporting work:<ul style="list-style-type: none"><li>(i) vise</li><li>(ii) clamps</li><li>(iii) saw bench</li></ul></li><li>(b) Methods of holding saws</li><li>(c) Direction of teeth for:<ul style="list-style-type: none"><li>(i) normal work</li><li>(ii) pull-stroke work</li></ul></li><li>(d) Correct blade tension</li><li>(e) Sawing procedures:<ul style="list-style-type: none"><li>(i) starting a cut; internal and external</li><li>(ii) pressure required</li><li>(iii) pressure relief on return stroke</li><li>(iv) optimum cutting speed</li></ul></li><li>(f) Procedure in sawing to a line</li><li>(g) Method of starting a new blade in an old cut</li><li>(h) Method of using saws in confined spaces</li><li>(i) Lubricants for saw blades</li></ul>
3. Sawing thin sections	<ul style="list-style-type: none"><li>(a) Selection of correct type of blade</li><li>(b) Use of wood or metal to support thin stock</li><li>(c) Methods of preventing distortion when clamping work</li><li>(d) Method of reduced blade angle to work to increase tooth contact</li></ul>
4. Sawing heavy sections	<ul style="list-style-type: none"><li>(a) Importance of maximum tooth contact with work and length of blade</li><li>(b) Method of holding and sawing heavy sections</li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- TRADE TOOLS AND PROCEDURES -

BLOCK 1: Trade Tools

UNIT 3: Cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
5. Sawing wood	<ul style="list-style-type: none"><li>(a) Methods and procedures in sawing heavy timbers:<ul style="list-style-type: none"><li>(i) single-handed</li><li>(ii) with two-man saws</li></ul></li><li>(b) Hazards relative to falling timbers</li><li>(c) Importance of employing protective devices and equipment</li><li>(d) Procedures in sawing thin boards</li><li>(e) Methods of sawing plywood</li><li>(f) Care, use and maintenance of powered hand saws:<ul style="list-style-type: none"><li>(i) sabre</li><li>(ii) circular</li></ul></li><li>(g) Procedures in sawing irregular shapes or contours using:<ul style="list-style-type: none"><li>(i) sabre saw</li><li>(ii) coping saw</li><li>(iii) pad-saw</li></ul></li><li>(h) Importance of supporting material when sawing</li><li>(i) Care, storage and protection of saws</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

OPERATIONS	KNOWLEDGE
6. Selecting and using chisels	<ul style="list-style-type: none"><li>(a) Types, purpose and use of metal, wood and masonry chisels</li><li>(b) Methods of chipping</li><li>(c) Characteristic of chisel cutting-edge angles for various materials</li><li>(d) Forging and heat treatment of chisels</li><li>(e) Type, purpose and application of wood chisels</li><li>(f) Methods of sharpening chisels:<ul style="list-style-type: none"><li>(i) filing</li><li>(ii) grinding</li><li>(iii) honing</li></ul></li><li>(g) Results of using mushroomed headed chisels</li><li>(h) Identification of correct chisel for job</li><li>(i) Science:<ul style="list-style-type: none"><li>(i) hardening and tempering of steel</li><li>(ii) physical properties of ferrous and non-ferrous metals</li><li>(iii) characteristics of wood</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 1: Trade Tools

UNIT 3: Cutting Tools

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### OPERATIONS

### KNOWLEDGE

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#### 7. Selecting files

- (a) Type, size and purpose of files:
  - (i) flat
  - (ii) round
  - (iii) square
  - (iv) triangular
  - (v) half-round
  - (vi) knife edge
  - (vii) other
- (b) File terminology
- (c) Types and application of various file cuts:
  - (i) single
  - (ii) double
  - (iii) bastard
  - (iv) curved tooth
  - (v) rasp
  - (vi) other
- (d) Factors governing selection of file:
  - (i) size and type of material of work
  - (ii) shape to be filed
  - (iii) finish required
- (e) Interpretation of file manufacturers catalogues in selection of files
- (f) Uses of safe-edge, riffler and needle files
- (g) Characteristics of files for efficient cutting of:
  - (i) soft metals
  - (ii) non-metallic

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

OPERATIONS	KNOWLEDGE
8. Filing	<ul style="list-style-type: none"><li>(a) Method of holding files</li><li>(b) Technique of holding work</li><li>(c) Correct position for filing</li><li>(d) Effect of height of workpiece</li><li>(e) Hazards when filing</li><li>(f) Filing procedures:<ul style="list-style-type: none"><li>(i) pressure required</li><li>(ii) pressure relief on return stroke</li><li>(iii) optimum speed of stroke</li></ul></li><li>(g) Draw-filing procedures</li><li>(h) Methods of filing flat surfaces</li><li>(i) Procedure in filing one surface square to another</li><li>(j) Technique of filing:<ul style="list-style-type: none"><li>(i) profiles</li><li>(ii) to a line</li></ul></li><li>(k) Methods of preventing scratches on work, e.g., chalk on file</li><li>(l) Method of cleaning file</li><li>(m) Care and storage of files</li><li>(n) Use of squares and straight-edges, to check accuracy when filing</li><li>(o) Methods of blending surfaces in freehand and contour filing</li><li>(p) Use of rotary motion when filing holes and radii</li><li>(q) Methods of protecting finished surfaces</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## -- TRADE TOOLS AND PROCEDURES --

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
9. Selecting hand shears and snips	<ul style="list-style-type: none"><li>(a) Purpose and principle of shearing</li><li>(b) Type, size and purpose of hand shearing tools:<ul style="list-style-type: none"><li>(i) straight snips</li><li>(ii) 'duck-bill' snips</li><li>(iii) curve snips, right and left cutting</li><li>(iv) rotary shears, lever operated</li><li>(v) bench shears</li><li>(vi) others</li></ul></li><li>(c) Factors governing selection of shears and snips:<ul style="list-style-type: none"><li>(i) type of material</li><li>(ii) thickness of material</li><li>(iii) shape of cut required</li><li>(iv) accessibility</li></ul></li><li>(d) Types, sizes and uses of powered hand shears, snips and nibblers</li><li>(e) Science:<ul style="list-style-type: none"><li>(i) levers</li><li>(ii) strength of material</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

OPERATIONS	KNOWLEDGE
10. Cutting materials with hand shears and snips	<ul style="list-style-type: none"><li>(a) Procedure of making a straight cut</li><li>(b) Methods of making curved cuts</li><li>(c) Technique of shearing to a layout</li><li>(d) Methods of starting an internal cut:<ul style="list-style-type: none"><li>(i) drilled or punched hole</li><li>(ii) chisel</li><li>(iii) puncture with shear blade, etc.</li></ul></li><li>(e) Hazards relative to burrs and sharp edges</li><li>(f) Method of shearing from under side of material</li><li>(g) Method of using shears held in a vise</li><li>(h) Procedures in cutting through bends and folds in stock</li><li>(i) Importance of employing hand protective equipment when handling sheet metal</li><li>(j) Limitations of shears in relation to thickness of material to be cut</li><li>(k) Methods and procedures for sharpening shears and snips</li><li>(l) Lubrication and maintenance of powered hand shears</li><li>(m) Care, adjustment, and storage of hand shearing tools</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 1: Trade Tools

UNIT 3: Cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
11. Selecting and using hand drills	<ul style="list-style-type: none"><li>(a) Type, size and purpose of hand drills:<ul style="list-style-type: none"><li>(i) brace, plain and ratchet</li><li>(ii) angular brace</li><li>(iii) geared hand drills</li><li>(iv) lever operated ratchet drill</li><li>(v) spiral push type drill</li><li>(vi) electric drills</li></ul></li><li>(b) Factors governing selection of drill:<ul style="list-style-type: none"><li>(i) size of hole required</li><li>(ii) availability of power</li><li>(iii) accessibility</li><li>(iv) material</li></ul></li><li>(c) Types and features and size of twist drills and bits:<ul style="list-style-type: none"><li>(i) straight, regular spiral</li><li>(ii) straight shank fast spiral</li><li>(iii) taper shank</li><li>(iv) wood bits</li></ul></li><li>(d) Types and characteristics of spiral drills and their uses</li><li>(e) Common sizes of twist drills:<ul style="list-style-type: none"><li>(i) fractional</li><li>(ii) number</li><li>(iii) letter</li></ul></li><li>(f) Special types of drills:<ul style="list-style-type: none"><li>(i) carbide-tipped</li><li>(ii) tubular</li><li>(iii) star</li></ul></li><li>(g) Edge angles, rake and clearance of twist drills for various materials</li><li>(h) Science:<ul style="list-style-type: none"><li>(i) heat treatment of metals</li><li>(ii) characteristics of wood</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
12. Grinding	<ul style="list-style-type: none"><li>(a) Types, purpose and uses of grinders<ul style="list-style-type: none"><li>(i) portable</li><li>(ii) pedestal</li><li>(iii) bench</li></ul></li><li>(b) Interpretation of manufacturers manuals to determine:<ul style="list-style-type: none"><li>(i) speeds</li><li>(ii) location and function of controls</li><li>(iii) wheel characteristics</li><li>(iv) capacity</li><li>(v) wheel and belt mounting procedure</li><li>(vi) lubrication specifications and procedures</li><li>(vii) maintenance and adjustments</li></ul></li><li>(c) Factors governing selection of grinders:<ul style="list-style-type: none"><li>(i) size and type of work</li><li>(ii) type of operation</li><li>(iii) accuracy required</li></ul></li><li>(d) Accessories used with grinders:<ul style="list-style-type: none"><li>(i) wheel and belt guards</li><li>(ii) work rests (for offhand work)</li><li>(iii) work holding devices</li><li>(iv) wheel dressing devices</li><li>(v) wheel balancing equipment</li></ul></li><li>(e) Methods of grinding</li><li>(f) Use of protective devices to be used when grinding</li><li>(g) Importance of correct adjustment of rests and other work holding devices</li><li>(h) Methods and procedures for balancing and testing grinding wheels</li><li>(i) Mathematics:<ul style="list-style-type: none"><li>Formula to determine R.P.M. and surface speed</li></ul></li><li>(j) Science:<ul style="list-style-type: none"><li>(i) abrasives</li><li>(ii) centrifugal force</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
13. Drilling holes in wood, metal, masonry, concrete or plaster	<ul style="list-style-type: none"><li>(a) Procedures for drilling holes in wood, metal, masonry, concrete, or plaster</li><li>(b) Techniques when breaking through</li><li>(c) Types, size and purpose of spur and expansive bits</li><li>(d) Types, size and function of carbide drills and high speed drills</li><li>(e) Type, size, and purpose of star drills</li><li>(f) Effects of dust-laden air and importance of ventilation when working in confined spaces</li><li>(g) Methods of sharpening drills and bits</li><li>(h) Methods of drilling holes with impact-type tools</li><li>(i) Care and storage of drills, bits, and drilling tools</li><li>(j) Types, characteristics and function of coolants used when drilling</li><li>(k) Importance of care when using pneumatic and electrically-powered drills</li><li>(l) Condition and importance of care when using extension cords with electrically-powered drills</li><li>(m) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to determine size and position of holes</li><li>(ii) conversion of fractional and decimal values</li></ul></li><li>(n) Science:<ul style="list-style-type: none"><li>(i) heat treatment of steel</li><li>(ii) abrasives</li><li>(iii) torque</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
14. Cutting and finishing holes in wood, concrete, masonry and plaster	<ul style="list-style-type: none"><li>(a) Type, size and use of chisels for<ul style="list-style-type: none"><li>(i) metal</li><li>(ii) wood</li><li>(iii) masonry</li></ul></li><li>(b) Methods of using chisels</li><li>(c) Importance of using correct hammer and chisel combinations</li><li>(d) Methods of holding chisels to avoid damaging hands</li><li>(e) Results of mushroom head on chisel</li><li>(f) Techniques of breaking through</li><li>(g) Importance of using sharp chisels and saws</li><li>(h) Techniques of hand sawing</li><li>(i) Methods of finishing with:<ul style="list-style-type: none"><li>(i) mortar</li><li>(ii) plaster</li><li>(iii) concrete</li></ul></li><li>(j) Type, use and features of trowels:<ul style="list-style-type: none"><li>(i) masonry</li><li>(ii) plastering</li></ul></li><li>(k) Characteristics of plaster, mortar and concrete mixes</li><li>(l) Care and storage of tools and equipment</li><li>(m) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine size and position of holes</li></ul></li><li>(n) Science:<ul style="list-style-type: none"><li>(i) properties of cement, concrete and plaster</li><li>(ii) abrasives</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 1: Trade Tools

### UNIT 3: Cutting Tools

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OPERATIONS	KNOWLEDGE
<hr/>	
15. Installing fasteners in wood, metal, concrete or masonry	<ul style="list-style-type: none"><li>(a) Type, characteristics of threaded fasteners, and anchors for:<ul style="list-style-type: none"><li>(i) wood</li><li>(ii) metal</li><li>(iii) concrete</li><li>(iv) masonry</li></ul></li><li>(b) Methods of installing threaded fasteners, and anchors</li><li>(c) Type, purpose and characteristics of impact tools</li><li>(d) Methods and importance of care when using impact tools</li><li>(e) Types and characteristics of charges used in impact guns</li><li>(f) Care and storage of tools and equipment</li><li>(g) Importance of vibration, expansion and contraction in holding power of anchors and fasteners</li><li>(h) Importance of wearing protective devices when using impact tools</li><li>(i) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine location of holes</li></ul></li><li>(j) Science:<ul style="list-style-type: none"><li>(i) explosives</li><li>(ii) properties of concrete, masonry</li><li>(iii) expansion and contraction</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

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### BLOCK 2: Pipe Tubing and Fittings

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# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

OPERATIONS	KNOWLEDGE
1. Soldering	<ul style="list-style-type: none"><li>(a) Type, characteristics, identification and application of pipes and tubing that can be joined by soldering</li><li>(b) Type, purpose and characteristics of heating appliances:<ul style="list-style-type: none"><li>(i) torches</li><li>(ii) irons</li></ul></li><li>(c) Sizes and weights of soldering irons</li><li>(d) Methods of heating soldering irons</li><li>(e) Methods of forging soldering irons</li><li>(f) Types and relative strength of various joints and seams</li><li>(g) Techniques of joint preparation</li><li>(h) Procedure for tinning soldering iron:<ul style="list-style-type: none"><li>(i) using salammoniac</li><li>(ii) using resin</li></ul></li><li>(i) Consideration of fluxes for use with various metals</li><li>(j) Methods of cleaning the surface of metals:<ul style="list-style-type: none"><li>(i) mechanically</li><li>(ii) chemically</li></ul></li><li>(k) Composition, solidification, liquefaction temperatures of tin/lead solder alloys</li><li>(l) Composition and melting points of low melting point alloys:<ul style="list-style-type: none"><li>(i) tin/lead/cadmium</li><li>(ii) tin/lead/bismuth</li><li>(iii) tin/antimony</li><li>(iv) others</li></ul></li><li>(m) Importance of care for storing or when handling or applying acids</li><li>(n) Methods of tinning a surface of metal</li><li>(o) Techniques of hard and soft soldering</li><li>(p) Methods of cleaning a finished soldered joint by:<ul style="list-style-type: none"><li>(i) defluxing</li><li>(ii) filing</li><li>(iii) sanding</li><li>(iv) buffing</li></ul></li><li>(q) Methods of testing for leaks</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Soldering (Cont'd)	<ul style="list-style-type: none"><li>(r) Procedure for making tinning dip</li><li>(s) Techniques for soft soldering by:<ul style="list-style-type: none"><li>(i) pre-heating</li><li>(ii) sweating</li><li>(iii) jigging</li><li>(iv) tacking</li></ul></li><li>(t) Special consideration for soft soldering:<ul style="list-style-type: none"><li>(i) aluminum alloys</li><li>(ii) white metal alloys</li></ul></li><li>(u) Types of work requiring hard soldering:<ul style="list-style-type: none"><li>(i) high pressure joints</li><li>(ii) explosive gas joints</li><li>(iii) ferrous metal joints</li></ul></li><li>(v) Types, melting points and uses of hard solders:<ul style="list-style-type: none"><li>(i) silver-copper alloys</li><li>(ii) silver-copper-zinc alloys</li></ul></li><li>(w) Procedure for setting up and adjusting heating devices for hard soldering</li><li>(x) Mathematics:<ul style="list-style-type: none"><li>(i) ratio and proportion to determine composition of solder</li><li>(ii) conversion fahrenheit and centigrade temperatures</li></ul></li><li>(y) Science:<ul style="list-style-type: none"><li>(i) surface tension</li><li>(ii) capillary action</li><li>(iii) action of acids, bases, salts</li><li>(iv) procedure to make chloride of zinc</li><li>(v) oxidation</li><li>(vi) galvanic corrosion</li><li>(vii) physical properties of ferrous and non-ferrous metal</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Brazing and welding	<ul style="list-style-type: none"><li>(a) Interpretation of manufacturers handbooks and manuals to determine:<ul style="list-style-type: none"><li>(i) gas and electric arc welding and/or brazing procedures</li><li>(ii) recommended pressures</li><li>(iii) sizes of tips and electrodes</li></ul></li><li>(b) Method of identification and characteristics of metals to be welded</li><li>(c) Type, purpose and application of heating devices:<ul style="list-style-type: none"><li>(i) oxy-acetylene</li><li>(ii) propane</li><li>(iii) electric arc</li></ul></li><li>(d) Procedures for igniting and setting-up gas heating device</li><li>(e) Methods of adjusting torches to obtain:<ul style="list-style-type: none"><li>(i) oxidizing flame</li><li>(ii) neutral flame</li><li>(iii) carbonizing flame</li></ul></li><li>(f) Techniques of joint preparations</li><li>(g) Type, size and use of welding and brazing rod</li><li>(h) Principles of gas and electric arc welding and/or brazing</li><li>(i) Type, characteristics and use of fluxes</li><li>(j) Methods of welding, brazing and cutting</li><li>(k) Methods of preventing distortion in work</li><li>(l) Purpose and method of preheating</li><li>(m) Techniques and effect of joining dissimilar metals</li><li>(n) Methods of protecting inflammable materials:<ul style="list-style-type: none"><li>(i) wet asbestos</li><li>(ii) metal plates</li><li>(iii) fireproof curtains</li><li>(iv) sand</li></ul></li><li>(o) Effect of oil and grease on valves and regulators</li><li>(p) Importance of using proper regulator reducing valves and rates of flow</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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### OPERATIONS

### KNOWLEDGE

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#### 2. Brazing and welding (Cont'd)

- (q) Importance and methods of providing adequate ventilation when cutting or welding in:
  - (i) tanks
  - (ii) pressure vessels
  - (iii) compartments or holds of ships
  - (iv) other confined spaces
- (r) Hazards when cutting or welding on or near vessels or piping containing inflammable liquids, vapors or gases
- (s) Methods of purging lines and vessels before welding and brazing
- (t) Importance of protection of welding hose lines from damage
- (u) Recognition, hazards and methods of correcting flash back
- (v) Importance of good electrical connection of arc welding equipment to:
  - (i) ground
  - (ii) lead
  - (iii) work
- (w) Familiarity with power supply control switching and fusing
- (x) Selection of electrode holders and cables for maximum rated current requirements
- (y) Importance of care of cables when welding overhead or near high tension cables
- (z) Hazards of striking arc on compressed gas cylinders
- (aa) Care and storage of arc welding equipment and cables
- (bb) Techniques and use of personal safety devices to prevent:
  - (i) eye flash
  - (ii) electric shock
- (cc) Methods of rendering first aid

AN ANALYSIS OF THE PLUMBING TRADE

- TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Brazing and welding (Cont'd)	(dd) Science: <ul style="list-style-type: none"><li>(i) preparation, properties, storage and uses of gases, e.g., acetylene and oxygen, etc.</li><li>(ii) conductors and insulators</li><li>(iii) galvanic corrosion</li><li>(iv) Thermal expansion and contraction</li><li>(v) elementary circuiting</li><li>(vi) simple generators AC and DC</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

OPERATIONS	KNOWLEDGE
3. Caulking	<ul style="list-style-type: none"><li>(a) Identification of pipe and joint characteristics</li><li>(b) Techniques for joining with special compounds:<ul style="list-style-type: none"><li>(i) hot sulphur</li><li>(ii) asbestos cement</li><li>(iii) lead wool</li></ul></li><li>(c) Nomenclature and use of packing irons</li><li>(d) Methods of preparing oakum for packing caulked joints</li><li>(e) Techniques for pouring and caulking lead:<ul style="list-style-type: none"><li>(i) vertical joints</li><li>(ii) horizontal joints</li><li>(iii) inverted joints</li><li>(iv) submerged joints</li></ul></li><li>(f) Adherence to relevant code requirements for caulk joints</li><li>(g) Results of overheating lead</li><li>(h) Techniques of supporting or hanging cast iron pipes</li><li>(i) Procedures for lighting and adjusting lead heating devices</li><li>(j) Methods of measuring and cutting cast iron pipes</li><li>(k) Importance of care when handling molten metal</li><li>(l) Methods of testing caulk joints with:<ul style="list-style-type: none"><li>(i) water</li><li>(ii) smoke</li><li>(iii) gas</li></ul></li><li>(m) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine lengths of pipe and fitting allowances</li></ul></li><li>(n) Science:<ul style="list-style-type: none"><li>(i) expansion and contraction</li><li>(ii) physical properties of lead cast iron</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
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4. Cutting and reaming pipe and tubing	<ul style="list-style-type: none"><li>(a) Type, purpose and use of pipe and tubing holding devices</li><li>(b) Features, type and use of pipe cutters:<ul style="list-style-type: none"><li>(i) single wheel</li><li>(ii) three wheel</li><li>(iii) multi-wheel</li><li>(iv) power-operated</li><li>(v) hacksaw</li><li>(vi) other</li></ul></li><li>(c) Procedures for cutting pipe and tubing</li><li>(d) Importance of square cuts</li><li>(e) Type, purpose and use of reamers</li><li>(f) Methods of reaming</li><li>(g) Application and purpose of lubricants used when cutting pipe or tubing</li><li>(h) Importance of protective devices and suitable clothing and care when cutting pipe and tubing</li><li>(i) Procedure for determining length of pipe and fitting allowances</li><li>(j) Importance of cleaning pipe of chips of metal</li><li>(k) Care and storage of cutters and reamers</li><li>(l) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine lengths of pipe and fitting allowances</li></ul></li><li>(m) Science:<ul style="list-style-type: none"><li>lubricants and their uses</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
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5. Threading pipe	<ul style="list-style-type: none"><li>(a) Interpretation of handbooks and specifications to determine:<ul style="list-style-type: none"><li>(i) length of thread (engagement)</li><li>(ii) insertion in fitting</li></ul></li><li>(b) Type, purpose and size of pipe threads -- right, left hand</li><li>(c) Pipe thread standards</li><li>(d) Work holding devices:<ul style="list-style-type: none"><li>(i) pipe vises</li><li>(ii) collets</li><li>(iii) chucks</li></ul></li><li>(e) Type, purpose and use of stocks and dies</li><li>(f) Procedure for setting dies to size</li><li>(g) Threading procedures</li><li>(h) Methods of setting or adjusting dies to cut:<ul style="list-style-type: none"><li>(i) standard loose thread</li><li>(ii) a tight thread</li><li>(iii) crooked thread</li></ul></li><li>(i) Classification and type of cutting fluids used in pipe threading</li><li>(j) Type, purpose and use of power driven threading machines</li><li>(k) Use of ratchet die holders</li><li>(l) Procedure for recutting damaged threads</li><li>(m) Methods of removing burrs from end of pipe</li><li>(n) Care and storage of pipe threading tools, equipment and accessories</li><li>(o) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to calculate thread engagement and length of pipe</li><li>(ii) conversion of decimal and fractional values</li></ul></li><li>(p) Science:<ul style="list-style-type: none"><li>(i) lubricants and their uses</li><li>(ii) properties of ferrous and non-ferrous metals</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
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6. Joining pipe with flanged fittings	<ul style="list-style-type: none"><li>(a) Interpretation of drawings to determine pipe:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) size</li></ul></li><li>(b) Adherence to relevant codes and regulations</li><li>(c) Methods of joining pipe with flanges that are:<ul style="list-style-type: none"><li>(i) threaded</li><li>(ii) welded</li><li>(iii) lap jointed</li></ul></li><li>(d) Nomenclature for flange and flanged fittings</li><li>(e) Use of manufacturer's handbooks to determine flange:<ul style="list-style-type: none"><li>(i) sizes</li><li>(ii) weight</li><li>(iii) number of holes</li><li>(iv) sizes of bolts</li></ul></li><li>(f) Types, purpose and characteristics of materials used for gaskets</li><li>(g) Procedures for cutting gaskets</li><li>(h) Methods for temporary slinging of pipe</li><li>(i) Procedures for aligning bolt holes in flanges</li><li>(j) Types and nomenclature for nuts and bolts</li><li>(k) Type, characteristics and function of box, open end and socket wrenches</li><li>(l) Procedures for tightening flange bolts</li><li>(m) Methods for marking and drilling a blank flange</li><li>(n) Methods of prick punching to relocate flange on pipe</li><li>(o) Procedures for tightening flange on threaded pipe</li><li>(p) Methods of "breaking" old flanged joints</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
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6. Joining pipe with flanged fittings (Cont'd)	(q) Importance of allowing for expansion and contraction of flanged piping by: (i) expansion loop (ii) expansion joints (iii) swing joints (r) Science: (i) expansion and contraction of metals (ii) galvanic corrosion

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

OPERATIONS	KNOWLEDGE
7. Joining pipe with compression type fittings	<ul style="list-style-type: none"><li>(a) Interpretation of drawing to determine:<ul style="list-style-type: none"><li>(i) type of pipe</li><li>(ii) size of pipe</li><li>(iii) type of fittings</li></ul></li><li>(b) Adherence to relevant codes and regulations</li><li>(c) Types, purpose and advantage of fittings that compress pipe by means of:<ul style="list-style-type: none"><li>(i) flared joint</li><li>(ii) flared joint and ring</li><li>(iii) ferrule</li><li>(iv) other</li></ul></li><li>(d) Nomenclature for compression type fittings</li><li>(e) Importance of providing for expansion and contraction of pipe</li><li>(f) Methods of reducing the effect of vibration on non-ferrous type piping</li><li>(g) Methods of holding, cutting and reaming non-ferrous tube</li><li>(h) Procedures for annealing or tempering non-ferrous type pipe</li><li>(i) Types, purpose and nomenclature of open end and flare nut wrenches</li><li>(j) Importance of using correct size and type of wrench</li><li>(k) Procedures for flaring various types of metal tubes</li><li>(l) Type, purpose and function of gasket materials used on compression joints</li><li>(m) Type, characteristics and function of packing materials suitable for various compression joints</li><li>(n) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine size and length of piping</li></ul></li><li>(o) Science:<ul style="list-style-type: none"><li>(i) physical properties of metals</li><li>(ii) expansion and contraction</li><li>(iii) heat treatment of metals</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
<hr/>	
8. Lead burning	<ul style="list-style-type: none"><li>(a) Interpretation of drawings to determine:<ul style="list-style-type: none"><li>(i) weight of lead</li><li>(ii) type of joint</li></ul></li><li>(b) Adherence to relevant codes and regulations</li><li>(c) Types, purpose and characteristics of lead burning devices</li><li>(d) Characteristics of good joint design</li><li>(e) Techniques of lead burning in various attitudes or position</li><li>(f) Procedures for lead burning to ensure:<ul style="list-style-type: none"><li>(i) uniform thickness</li><li>(ii) complete fusion</li></ul></li><li>(g) Considerations and importance of using lead burning for specific installations</li><li>(h) Importance of supporting sheet lead when in<ul style="list-style-type: none"><li>(i) vertical position</li><li>(ii) horizontal position</li></ul></li><li>(i) Importance of adequate ventilation when burning lead</li><li>(j) Effects and treatment of lead poisoning</li><li>(k) Methods of preparing lead "rod" from parent material to secure homogenous weld</li><li>(l) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine length and location areas</li></ul></li><li>(m) Science:<ul style="list-style-type: none"><li>(i) properties of lead</li><li>(ii) fusion of metals</li><li>(iii) Oxidation</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
<hr/>	
9. Wiping joints	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) requirements</li><li>(ii) size of pipe and joint</li></ul></li><li>(b) Adherence to relevant codes governing use and design of wiped joints</li><li>(c) Consideration of joint design for:<ul style="list-style-type: none"><li>(i) lead to lead joints</li><li>(ii) lead to brass joints</li><li>(iii) lead to copper</li></ul></li><li>(d) Techniques for preparation and wiping joints:<ul style="list-style-type: none"><li>(i) flange</li><li>(ii) butt</li><li>(iii) under hand</li><li>(iv) vertical</li><li>(v) rolled</li></ul></li><li>(e) Type, use and fabrication of wiping cloths:<ul style="list-style-type: none"><li>(i) sizes</li><li>(ii) thickness</li><li>(iii) material</li></ul></li><li>(f) Type, purpose and methods of using lead wiping tools</li><li>(g) Care and storage of wiping cloths</li><li>(h) Preparation and use of plumbers smudge and paste</li><li>(i) Composition and properties of wiping solder alloys</li><li>(j) Methods of testing alloy of wiping solder</li><li>(k) Methods of cleaning a pot of solder</li><li>(l) Type, purpose and characteristic of heating devices:<ul style="list-style-type: none"><li>(i) gasoline firepot or torch</li><li>(ii) propane firepot or torch</li><li>(iii) gas burner or torch</li></ul></li><li>(m) Method of lighting and adjusting heating devices</li><li>(n) Importance of care and hazards when handling molten metal</li><li>(o) Methods and importance of preventing contamination of lead and solder</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

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OPERATIONS	KNOWLEDGE
<hr/>	
9. Wiping joints (Cont'd)	<ul style="list-style-type: none"><li>(p) Type, selection and use of suitable fluxes</li><li>(q) Importance of care when:<ul style="list-style-type: none"><li>(i) using molten metal</li><li>(ii) treating of burns</li></ul></li><li>(r) Protection and storage of lead tools and heating devices</li><li>(s) Care in handling and storage of lead pipe</li><li>(t) Method of cooling, marking and storing solder</li><li>(u) Procedure for handling supporting and protecting lead pipes</li><li>(v) Characteristics and use of fire extinguishers</li><li>(w) Science:<ul style="list-style-type: none"><li>(i) properties of ferrous and non ferrous metals</li><li>(ii) galvanic corrosion</li><li>(iii) purification of metals</li><li>(iv) Types, uses and action of fire extinguishers</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 1: Joining Techniques

OPERATIONS	KNOWLEDGE
10. Cementing joints	<ul style="list-style-type: none"><li>(a) Identification of pipe and materials used in cementing</li><li>(b) Adherence to relevant codes for:<ul style="list-style-type: none"><li>(i) size</li><li>(ii) design</li><li>(iii) composition</li></ul></li><li>(c) Methods of preparation of cement mixtures</li><li>(d) Procedure and techniques for preparing and making cement joints</li><li>(e) Importance of raking joints</li><li>(f) Methods of aligning pipes</li><li>(g) Methods of supporting pipes</li><li>(h) Techniques for cutting out, replacing and cementing a new pipe in an existing line</li><li>(i) Advantages and disadvantages of cemented joints</li><li>(j) Science:<ul style="list-style-type: none"><li>(i) composition and properties of cement, mortar and concrete</li><li>(ii) efflorescent substances</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 2: Bending and Forming Techniques

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Bending pipe and tubing	<ul style="list-style-type: none"><li>(a) Types, care and use of tube bending tools and equipment:<ul style="list-style-type: none"><li>(i) mechanical power benders</li><li>(ii) hydraulic benders</li><li>(iii) shoe and slide hand benders</li><li>(iv) spring supporters</li></ul></li><li>(b) Methods of preventing collapse of tubing:<ul style="list-style-type: none"><li>(i) filling with sand, lead, resin, etc.</li><li>(ii) inside and outside spring mandrels</li><li>(iii) stationary mandrels</li></ul></li><li>(c) Methods of establishing centres of bends for matching connections</li><li>(d) Use of wire templates</li><li>(e) Bending procedures</li><li>(f) Methods of annealing:<ul style="list-style-type: none"><li>(i) steel tubing</li><li>(ii) copper tubing</li><li>(iii) lead pipe</li></ul></li><li>(g) Interpretation of manufacturers catalogues and handbooks to determine:<ul style="list-style-type: none"><li>(i) suitable procedures</li><li>(ii) allowable radii</li><li>(iii) tubing specifications</li></ul></li><li>(h) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to calculate tubing length</li><li>(ii) length of arc of a circle to calculate bend</li><li>(iii) calculation for bend allowance</li></ul></li><li>(i) Science:<ul style="list-style-type: none"><li>(i) properties of ferrous and non-ferrous metals</li><li>(ii) heat treatment of metals</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 2: Bending and Forming Technique

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Bending sheet metal	<ul style="list-style-type: none"><li>(a) Interpretation of drawings to determine material:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) gauge</li><li>(iii) size</li></ul></li><li>(b) Factors governing selection of bending procedure:<ul style="list-style-type: none"><li>(i) size and thickness of metal</li><li>(ii) physical properties of metal</li></ul></li><li>(c) Adherence to relevant codes and regulations regarding material:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) gauge</li></ul></li><li>(d) Procedures for laying out on metal:<ul style="list-style-type: none"><li>(i) marking compounds</li><li>(ii) marking devices</li></ul></li><li>(e) Methods of allowances for:<ul style="list-style-type: none"><li>(i) spring back</li><li>(ii) bend allowances</li><li>(iii) radii calculations</li></ul></li><li>(f) Procedures for bending iron, copper or lead sheet using:<ul style="list-style-type: none"><li>(i) bending machines</li><li>(ii) edges of benches</li><li>(iii) forming jigs</li><li>(iv) bending tools</li></ul></li><li>(g) Methods of protecting finished surfaces when bending</li><li>(h) Importance of care when storing or handling sheet metals</li><li>(i) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurements to determine size of material and location of openings</li><li>(ii) bend radii calculations</li><li>(iii) conversion of decimal and fractions to determine equivalent gauges</li><li>(iv) percentage to determine costs</li></ul></li><li>(j) Science:<ul style="list-style-type: none"><li>properties of ferrous and non-ferrous metals</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 2: Bending and Forming Techniques

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OPERATIONS	KNOWLEDGE
<hr/>	
3. Forming and bending bar stock	<ul style="list-style-type: none"><li>(a) Interpretation of drawing to determine material required</li><li>(b) Principles and techniques of bending metal by:<ul style="list-style-type: none"><li>(i) cold working</li><li>(ii) heating</li></ul></li><li>(c) Type, care and use of heating devices:<ul style="list-style-type: none"><li>(i) gas torches</li><li>(ii) forges</li></ul></li><li>(d) Factors governing selection of material:<ul style="list-style-type: none"><li>(i) appearance</li><li>(ii) physical properties</li><li>(iii) size and thickness</li></ul></li><li>(e) Limitations of cold bending</li><li>(f) Procedures for localizing and controlling bends</li><li>(g) Importance of correct temperature when hot bending materials</li><li>(h) Methods of localizing heat in bend area</li><li>(i) Effects of heat on non-ferrous metals</li><li>(j) Procedures for cold bending material:<ul style="list-style-type: none"><li>(i) in a vise</li><li>(ii) in pivot benders</li><li>(iii) in a jig</li></ul></li><li>(k) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to determine size and length of material</li><li>(ii) bend and radii formulae</li></ul></li><li>(l) Science:<ul style="list-style-type: none"><li>(i) physical properties of metals</li><li>(ii) expansion and contraction</li><li>(iii) effect of heat on molecular structure of metals</li><li>(iv) oxidation</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 2: Bending and Forming Techniques

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OPERATIONS	KNOWLEDGE
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4. Hardening, annealing and heat treating metals	<ul style="list-style-type: none"><li>(a) Purpose of heat-treating metals</li><li>(b) Classification of heat-treatment:<ul style="list-style-type: none"><li>(i) hardening</li><li>(ii) tempering</li><li>(iii) annealing</li><li>(iv) stress-relieving</li></ul></li><li>(c) Identification of common metals by:<ul style="list-style-type: none"><li>(i) sight</li><li>(ii) file test</li><li>(iii) spark test</li></ul></li><li>(d) Types, care and use of heat treatment devices</li><li>(e) Purpose and methods of quenching</li><li>(f) Types and features of quenching media:<ul style="list-style-type: none"><li>(i) water</li><li>(ii) oil</li><li>(iii) air</li></ul></li><li>(g) Interpretation of handbooks to determine:<ul style="list-style-type: none"><li>(i) composition of various alloys</li><li>(ii) critical temperatures of various metals</li><li>(iii) characteristics of various common metals</li></ul></li><li>(h) Recognition of temperature range by colour of metal</li><li>(i) Science:<ul style="list-style-type: none"><li>(i) physical properties of metals</li><li>(ii) effect of heat-treatment on<ul style="list-style-type: none"><li>(a) physical properties</li><li>(b) chemical properties</li></ul></li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 2: Bending and Forming Techniques

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OPERATIONS	KNOWLEDGE
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5. Forming lead	<ul style="list-style-type: none"><li>(a) Interpretation of drawing to determine material:<ul style="list-style-type: none"><li>(i) size</li><li>(ii) weight</li></ul></li><li>(b) Adherence to relevant regulations and codes</li><li>(c) Care in storing and handling lead to prevent:<ul style="list-style-type: none"><li>(i) bruising</li><li>(ii) scratching</li></ul></li><li>(d) Importance of care in laying out to prevent scratching or indenting</li><li>(e) Procedures for bossing or dressing lead</li><li>(f) Type, purpose and function of lead forming tools</li><li>(g) Methods of joint preparation</li><li>(h) Procedures for joining lead:<ul style="list-style-type: none"><li>(i) soldering</li><li>(ii) wiping</li><li>(iii) lead burning</li></ul></li><li>(i) Importance of supporting lead when:<ul style="list-style-type: none"><li>(i) forming</li><li>(ii) installing</li></ul></li><li>(j) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to determine size and layout</li><li>(ii) fractions and decimals to determine weight and cost</li></ul></li><li>(k) Science:<ul style="list-style-type: none"><li>(i) physical properties of lead</li><li>(ii) effects and treatment of lead poisoning</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 3: Installation

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### OPERATIONS

### KNOWLEDGE

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1. Selecting pipe and tubing
- (a) Interpretation of drawings and specifications to determine:
    - (i) requirements
    - (ii) size
  - (b) Adherence to relevant codes and regulations
  - (c) Methods of manufacture of pipe and tubing
  - (d) Types, sizes, lengths and classifications of pipes and tubing:
    - (i) wrought iron
    - (ii) steel
    - (iii) cast iron
    - (iv) copper
    - (v) lead
    - (vi) brass
    - (vii) vitrified tile
    - (viii) concrete
    - (ix) bituminized fibre
    - (x) cement asbestos combination (transite)
    - (xi) plastic
    - (xii) stainless steel
    - (xiii) glass
    - (xiv) dur iron
    - (xv) others
  - (e) Characteristics of working and bursting pressures, factors of safety and application of pipe and tubing.
  - (f) Environmental and ambient consideration in the use of pipe.
  - (g) Mathematics:
    - (i) calculation to determine cross section area
    - (ii) calculating for diameter, circumference Barlow's formula
  - (h) Science:
    - (i) corrosion
    - (ii) electrolysis
    - (iii) galvanic corrosion
    - (iv) protective coatings
    - (v) expansion and contraction
    - (vi) properties of ferrous and non-ferrous metals
    - (vii) properties of glass and ceramics
    - (viii) plastic, thermo setting and thermo plastics.

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 3: Installation

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Installing threaded pipe	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) size</li><li>(iii) location</li></ul></li><li>(b) Adherence to relevant codes and regulations for:<ul style="list-style-type: none"><li>(i) material</li><li>(ii) type</li><li>(iii) size</li></ul></li><li>(c) Interpretation of manufacturers specifications for:<ul style="list-style-type: none"><li>(i) weights of pipe - standard, extra heavy, and double extra heavy</li><li>(ii) types of manufacture of pipe - buttweld lapweld seamless</li></ul></li><li>(d) Types, size, length and application of pipe:<ul style="list-style-type: none"><li>(i) galvanized</li><li>(ii) black</li><li>(iii) copper</li><li>(iv) brass</li><li>(v) stainless steel</li><li>(vi) plastic</li><li>(vii) other</li></ul></li><li>(e) Standard practices for:<ul style="list-style-type: none"><li>(i) accepted lengths of pipe</li><li>(ii) number of pipes per bundle</li></ul></li><li>(f) Interpretation of A.S.M.E. standard thread tables:<ul style="list-style-type: none"><li>(i) nominal and actual sizes</li><li>(ii) taper on threads</li><li>(iii) male and female threads</li><li>(iv) left and right hand threads</li><li>(v) number of threads per inch</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 3: Installation

OPERATIONS	KNOWLEDGE
2. Installing threaded pipe (Cont'd)	<ul style="list-style-type: none"> <li>(g) Methods of joining pipe by: <ul style="list-style-type: none"> <li>(i) soldering</li> <li>(ii) welding</li> <li>(iii) brazing</li> <li>(iv) wiping</li> <li>(v) threading</li> <li>(vi) flanging</li> <li>(vii) swaged</li> <li>(viii) gasketing</li> <li>(ix) lead burning</li> </ul> </li> <li>(h) Procedures for measuring pipe and allowances for fittings</li> <li>(i) Methods of holding pipe</li> <li>(j) Procedures for cutting various types of pipe</li> <li>(k) Advantages, disadvantages and suitability of various pipe cutting devices</li> <li>(l) Importance of reaming pipe</li> <li>(m) Methods and procedures for reaming pipe</li> <li>(n) Types, advantages and function of pipe threading tools fitted with: <ul style="list-style-type: none"> <li>(i) block dies</li> <li>(ii) two-piece dies</li> <li>(iii) multiple dies</li> <li>(iv) power vise</li> <li>(v) power dies</li> </ul> </li> <li>(o) Methods of adjusting dies to obtain a thread that is: <ul style="list-style-type: none"> <li>(i) standard</li> <li>(ii) loose</li> <li>(iii) tight</li> <li>(iv) crooked</li> <li>(v) running</li> </ul> </li> <li>(p) Selection and application of cutting oils as: <ul style="list-style-type: none"> <li>(i) lubrication</li> <li>(ii) heat dissipant</li> </ul> </li> <li>(q) Methods of cutting nipples using: <ul style="list-style-type: none"> <li>(i) pipe stub and coupling</li> <li>(ii) nipple chuck</li> </ul> </li> <li>(r) Terminology and standard lengths for nipples</li> </ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 3: Installation

OPERATIONS	KNOWLEDGE
2. Installing threaded pipe (Cont'd)	<ul style="list-style-type: none"><li>(s) Nomenclature for standard pipe fittings</li><li>(t) Terminology for reading pipe fittings and pipes</li><li>(u) Types, purpose, and function of thread compounds</li><li>(v) Types, purpose and advantages of various wrenches</li><li>(w) Methods of making up fittings:<ul style="list-style-type: none"><li>(i) with wrenches</li><li>(ii) with stub of pipe</li></ul></li><li>(x) Procedures for aligning openings of fitting on pipe installations</li><li>(y) Methods of installing pipe with an awareness to:<ul style="list-style-type: none"><li>(i) aligning threads</li><li>(ii) temporary slings or hangers</li><li>(iii) starting thread by hand</li><li>(iv) suitable type and size of wrench</li><li>(v) prevention of straining previously installed sections</li></ul></li><li>(z) Types, purpose and advantages of various hanging devices</li><li>(aa) Positioning, aligning and levelling hangers</li><li>(bb) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to calculate pipe requirements</li><li>(ii) decimal and fractional values to determine pipe and fitting allowances</li><li>(iii) square root to calculate diameters from cross-sectional area of a pipe</li></ul></li><li>(cc) Science:<ul style="list-style-type: none"><li>(i) corrosion</li><li>(ii) electrolysis</li><li>(iii) lubricants</li><li>(iv) heat of friction</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 3: Installation

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OPERATIONS

KNOWLEDGE

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3. Installing tubing

- (a) Interpretation of manufacturers drawings and specifications to determine:
  - (i) installation requirements
  - (ii) dimensions
- (b) Type, size and classification of tubing
- (c) Application and use of tubing
- (d) Limitation for underground installations
- (e) Adherence to relevant codes and regulations governing use of tubing
- (f) Type, purpose and size of fittings
- (g) Methods of joining:
  - (i) soldering
  - (ii) brazing
  - (iii) swaging
  - (iv) pressure fittings
  - (v) other
- (h) Interpretation of manufacturers specifications to determine fitting allowances
- (i) Importance and purpose of loops in tubing
- (j) Mathematics:
  - (i) linear measurement to calculate installation requirements
  - (ii) decimal and/or fractional values to determine fitting allowance
- (k) Science:
  - (i) physical properties of lead, copper, plastics, glass, rubber
  - (ii) electrolysis
  - (iii) galvanic corrosion
  - (iv) protective finishes
  - (v) corrosion
  - (vi) expansion and contraction
  - (vii) crystallization of metals

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 3: Installation

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OPERATIONS	KNOWLEDGE
<hr/>	
4. Selecting and installing pipe hangers	<ul style="list-style-type: none"><li>(a) Interpretation of drawings to determine hanger:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) location</li><li>(iii) time element for installation</li></ul></li><li>(b) Adherence to relevant codes and regulations</li><li>(c) Methods of pipe suspension from structural member by:<ul style="list-style-type: none"><li>(i) drilling and tapping</li><li>(ii) expansion shields</li><li>(iii) toggle bolts</li><li>(iv) welding</li><li>(v) clamps</li><li>(vi) other</li></ul></li><li>(d) Types, purpose and terminology for:<ul style="list-style-type: none"><li>(i) machine screws</li><li>(ii) wood screws</li><li>(iii) coach and lag screws</li></ul></li><li>(e) Importance of care when using impact type fastener devices</li><li>(f) Procedures for hanging or supporting pipe by:<ul style="list-style-type: none"><li>(i) pipe hooks</li><li>(ii) extension bar</li><li>(iii) solid ring hangers</li><li>(iv) pipe rings</li><li>(v) pipe rolls</li><li>(vi) pipe saddles</li><li>(vii) U bolts</li><li>(viii) hanger rods</li><li>(ix) concrete or brick piers</li><li>(x) brackets</li><li>(xi) clamps</li><li>(xii) other</li></ul></li><li>(g) Mathematics:<ul style="list-style-type: none"><li>linear measurement to position hangers</li></ul></li><li>(h) Science:<ul style="list-style-type: none"><li>expansion and contraction</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 3: Installation

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OPERATIONS	KNOWLEDGE
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5. Selecting and installing valves	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and sketches to determine valve:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) size</li><li>(iii) location</li><li>(iv) material</li></ul></li><li>(b) Adherence to relevant codes and regulations</li><li>(c) Type, purpose and terminology of valves:<ul style="list-style-type: none"><li>(i) gate, rising and non-rising stem</li><li>(ii) O.S. &amp; Y. valves</li><li>(iii) sliding stem</li><li>(iv) globe, angle and straight</li><li>(v) check, swing and vertical</li><li>(vi) pressure reducing</li><li>(vii) relief</li><li>(viii) others</li></ul></li><li>(d) Effects of too rapid opening and closing of valves</li><li>(e) Importance of installing globe valves in relation to the direction of flow</li><li>(f) Characteristics of the gate valve on water supply mains</li><li>(g) Purpose of the by-pass valve on large supply mains or valves</li><li>(h) Effects of installing check valves at variance with direction of flow</li><li>(i) Importance of bronze mounted seats in check valves</li><li>(j) Importance of choosing the correct globe valve disc to suit:<ul style="list-style-type: none"><li>(i) pressure</li><li>(ii) temperature</li><li>(iii) service and conditioning</li></ul></li><li>(k) Methods of re-grinding seats in valves</li><li>(l) Awareness of conditions conducive to wire-drawing of valve seats</li><li>(m) Reasons for square thread and low pitch on valve spindles</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 2: Pipe, Tubing and Fittings

UNIT 3: Installation

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OPERATIONS	KNOWLEDGE
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5. Selecting and installing valves (Cont'd)	(n) Types, purpose and function of stuffing boxes (o) Importance of Graphite impregnated, durable gland packings (p) Methods of repacking glands (q) Identification symbols on drawings for valves (r) Importance of positions and location of valves: (i) accessibility (ii) operating efficiently (s) Importance of tagging and charting valves (t) Science: flow of fluids, frictional losses

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

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### BLOCK 3: Rigging

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AN ANALYSIS OF THE PLUMBING TRADE

- TRADE TOOLS AND PROCEDURES -

BLOCK 3: Rigging

UNIT 1: Material Handling Devices

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OPERATIONS	KNOWLEDGE
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1. Moving equipment on rollers	(a) Types, use and care of rollers: (i) wood (ii) steel-solid (iii) steel-hollow pipe (iv) special roller units (b) Methods of moving equipment on skids and skid plates (c) Types of lubricant used with skids and skid plates (d) Methods of controlling loads on slopes (e) Methods of changing direction (f) Roller size and spacing for protection of floor and equipment (g) Types of runners (planking, etc.) used with rollers for protection of: (i) floor (ii) equipment (h) Importance of exercising extreme care in moving equipment on rollers (i) Science: (i) concentrated and uniform floor loadings (ii) lubricants and their uses

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 3: Rigging

### UNIT 1: Material Handling Devices

OPERATIONS	KNOWLEDGE
2. Moving and positioning equipment with jacks	<ul style="list-style-type: none"><li>(a) Type, purpose and use of jacks:<ul style="list-style-type: none"><li>(i) mechanical</li><li>(ii) hydraulic</li></ul></li><li>(b) Techniques of moving heavy equipment</li><li>(c) Importance of solid footing</li><li>(d) Consideration in the positioning of jacks</li><li>(e) Methods employed to prevent damage to equipment</li><li>(f) Use of blocking and shimming for angle jacking</li><li>(g) Methods of supporting jacks when used in horizontal position</li><li>(h) Methods of blocking up equipment</li><li>(i) Correct length of bar for size of jack</li><li>(j) Need for extreme care in the use of jacks</li><li>(k) Importance of proper lubrication of jacks</li><li>(l) Types, characteristics and use of lubricants and hydraulic oils</li><li>(m) Importance of regular inspection of jacks</li><li>(n) Types, purpose and maintenance of valves used in hydraulic jacks</li><li>(o) Inspection and maintenance of mechanical jacks</li><li>(p) Science:<ul style="list-style-type: none"><li>(i) screw pitches</li><li>(ii) principles of levers</li><li>(iii) Pascal's principle - transmission of pressure in liquids</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 3: Rigging

### UNIT 1: Material Handling Devices

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OPERATIONS	KNOWLEDGE
<hr/>	
3. Lifting and pulling	<ul style="list-style-type: none"><li>(a) Methods of load-weight estimation</li><li>(b) Techniques of "drifting" loads by the use of two or more hoists</li><li>(c) Moving loads on an inclined plane</li><li>(d) Methods of balancing loads by means of an auxiliary hoist</li><li>(e) Importance of centering hoist over load balance center before lifting</li><li>(f) Results of improper operation:<ul style="list-style-type: none"><li>(i) chain wear and/or breakage</li><li>(ii) hook wear and/or distortion</li><li>(iii) excessive wear of hoist components, etc.</li></ul></li><li>(g) Methods of handling long pieces of equipment:<ul style="list-style-type: none"><li>(i) upending</li><li>(ii) lying down</li></ul></li><li>(h) Special techniques employed in handling onto or off:<ul style="list-style-type: none"><li>(i) railroad cars</li><li>(ii) platform trailers</li><li>(iii) ramps, etc.</li></ul></li><li>(i) Techniques of lifting or carrying pipe and material manually</li><li>(j) Methods of moving equipment by use of:<ul style="list-style-type: none"><li>(i) winches</li><li>(ii) "snatch" blocks</li></ul></li><li>(k) Importance of regular inspection and maintenance</li><li>(l) Mathematics:<ul style="list-style-type: none"><li>Calculation of loads</li><li>(i) weights</li><li>(ii) centers of gravity</li></ul></li><li>(m) Science:<ul style="list-style-type: none"><li>(i) static and sliding friction</li><li>(ii) theory of inclined plane</li><li>(iii) mechanical advantage</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

BLOCK 3: Rigging

UNIT 2: Scaffolds and Ladders

---

OPERATIONS	KNOWLEDGE
<hr/>	
1. Erecting ladder, scaffolds	<ul style="list-style-type: none"><li>(a) Types, use and care of ladders:<ul style="list-style-type: none"><li>(i) straight</li><li>(ii) extension</li><li>(iii) platform</li><li>(iv) special</li></ul></li><li>(b) Importance of sound material for ladders and planking</li><li>(c) Use of planking with ladders</li><li>(d) Importance of solid footing</li><li>(e) Placement of ladders on slopes</li><li>(f) Importance of maintaining proper ladder angle</li><li>(g) Results of contact of metal ladders and planking with electrical devices</li><li>(h) Methods of transporting ladders by hand:<ul style="list-style-type: none"><li>(i) in horizontal position</li><li>(ii) in vertical position</li></ul></li><li>(i) Methods of erecting ladders:<ul style="list-style-type: none"><li>(i) straight</li><li>(ii) extension</li></ul></li><li>(j) Importance of regular inspection of ladders and planking</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 3: Rigging

### UNIT 2: Scaffolds and Ladders

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Erecting platform scaffolds	<ul style="list-style-type: none"><li>(a) Types, use and care of platform scaffolds:<ul style="list-style-type: none"><li>(i) single and multiple plank (wood and metal)</li><li>(ii) rigid platform</li><li>(iii) ladder and plank</li></ul></li><li>(b) Importance of regular inspection of scaffolds and supports</li><li>(c) Methods of hanging scaffolds:<ul style="list-style-type: none"><li>(i) single rope support</li><li>(ii) use of needle beams</li><li>(iii) rope blocks</li></ul></li><li>(d) Methods of limiting swinging of hanging scaffolds</li><li>(e) Importance of hand rails and/or safety belts</li><li>(f) Importance of minimum plank overhang</li><li>(g) Need for strict adherence to all safety rules</li><li>(h) Science:<ul style="list-style-type: none"><li>(i) strength of materials</li><li>(ii) principles of levers</li><li>(iii) pulleys and pulley systems</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 3: Rigging

### UNIT 3: Ropes, Slings, and Hoists

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Lifting heavy objects	<ul style="list-style-type: none"><li>(a) Type, function and use of chain and rope hoists</li><li>(b) Methods of hanging hoists</li><li>(c) Types, purpose and use of slings</li><li>(d) Methods of slinging</li><li>(e) Importance of care and protection of slings</li><li>(f) Use and function of pinch bars and screw jacks</li><li>(g) Techniques and limitations when lifting heavy objects:<ul style="list-style-type: none"><li>(i) mechanically</li><li>(ii) manually</li></ul></li><li>(h) Importance of seeking supervisory or professional advice on load bearing capabilities of structure</li><li>(i) Importance of exercising care when hoisting</li><li>(j) Science:<ul style="list-style-type: none"><li>(i) mechanical advantage of simple machines</li><li>(ii) reaction at supports</li><li>(iii) pulley blocks</li><li>(iv) levers</li><li>(v) stresses, tensile, compression and shear</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- TRADE TOOLS AND PROCEDURES -

BLOCK 3: Rigging

UNIT 3: Ropes, Slings, and Hoists

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Selecting slinging	<ul style="list-style-type: none"><li>(a) Interpretation of manufacturer's specifications to determine:<ul style="list-style-type: none"><li>(i) sling member angles and allowable loads</li><li>(ii) strength of rope, cable and chain</li><li>(iii) strength of shackles</li><li>(iv) clamping strength of cable clamps</li></ul></li><li>(b) Types, use and care of slings:<ul style="list-style-type: none"><li>(i) rope</li><li>(ii) cable</li><li>(iii) chain (plain, monel, stainless, etc.)</li></ul></li><li>(c) Types, use and care of attachments:<ul style="list-style-type: none"><li>(i) thimbles</li><li>(ii) clamps</li><li>(iii) shackles</li><li>(iv) spreader bars</li><li>(v) equalizer bars</li><li>(vi) special lifting devices</li></ul></li><li>(d) Types and strength of splices:<ul style="list-style-type: none"><li>(i) long</li><li>(ii) short</li><li>(iii) end-to-end</li><li>(iv) thimble</li></ul></li><li>(e) Mathematics:<ul style="list-style-type: none"><li>(i) vectors to calculate resultant forces</li><li>(ii) trigonometry to calculate sling angles</li></ul></li><li>(f) Science:<ul style="list-style-type: none"><li>(i) tension</li><li>(ii) compression</li><li>(iii) factor of safety</li><li>(iv) principles of levers</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 3: Rigging

### UNIT 3: Ropes, Slings and Hoists

OPERATIONS	KNOWLEDGE
3. Installing slinging	<ul style="list-style-type: none"><li>(a) Techniques of installing lashing</li><li>(b) Method of positioning, lashings and slings for:<ul style="list-style-type: none"><li>(i) balanced loads</li><li>(ii) unbalanced loads</li></ul></li><li>(c) Importance of protection to equipment</li><li>(d) Results of sharp bends and kinks</li><li>(e) Techniques of joining cables by the use of clamps</li><li>(f) Methods of tying knots:<ul style="list-style-type: none"><li>(i) bowline</li><li>(ii) clove hitch</li><li>(iii) reef</li><li>(iv) half hitch, timber hitch, etc.</li></ul></li><li>(g) Allowances for:<ul style="list-style-type: none"><li>(i) slack take-up</li><li>(ii) member stretching</li></ul></li></ul>
4. Maintaining slings and rope	<ul style="list-style-type: none"><li>(a) Interpretation of manufacturers' specifications to determine procedures for:<ul style="list-style-type: none"><li>(i) testing</li><li>(ii) heat treating (chains)</li><li>(iii) inspection</li><li>(iv) replacement</li></ul></li><li>(b) Results of dampness and exposure to corrosive conditions</li><li>(c) Importance of proper storage</li><li>(d) Importance of protection for hands (gloves) when handling</li><li>(e) Science:<ul style="list-style-type: none"><li>(i) corrosion</li><li>(ii) factors of safety</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - TRADE TOOLS AND PROCEDURES -

### BLOCK 3: Rigging

### UNIT 3: Ropes, Slings, and Hoists

OPERATIONS	KNOWLEDGE
5. Selecting hoists	<ul style="list-style-type: none"><li>(a) Interpretation of handbooks to determine strength of rope, chain and cable</li><li>(b) Types, application, use and care of hand operated hoists:<ul style="list-style-type: none"><li>(i) rope blocks</li><li>(ii) spur gear</li><li>(iii) worm gear</li><li>(iv) differential gear</li><li>(v) link chain</li><li>(vi) roller chain</li></ul></li><li>(c) Types, application, use and care of power operated hoists:<ul style="list-style-type: none"><li>(i) electric</li><li>(ii) pneumatic</li></ul></li><li>(d) Types, use and care of safety hooks:<ul style="list-style-type: none"><li>(i) swing type tongue</li><li>(ii) spring loaded tongue</li><li>(iii) counterweighted tongue</li></ul></li><li>(e) Hoist load capacities</li><li>(f) Lift height</li><li>(g) Recognition and use of hand signals with hoisting</li><li>(h) Science:<ul style="list-style-type: none"><li>(i) mechanical advantage</li><li>(ii) pulleys and pulley systems</li></ul></li></ul>
6. Hanging hoists	<ul style="list-style-type: none"><li>(a) Importance of obtaining professional advice regarding strength of support members</li><li>(b) Methods of providing additional support</li><li>(c) Use of isolated supports:<ul style="list-style-type: none"><li>(i) tripods</li><li>(ii) "A" frames</li></ul></li><li>(d) Techniques of hanging hoist to supporting member by:<ul style="list-style-type: none"><li>(i) slings</li><li>(ii) scissor clamps, etc.</li></ul></li><li>(e) Methods of preventing unhooking</li><li>(f) Importance of proper inspection before operation</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

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## BLOCK 4: Supports - Hangers - Fasteners

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# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 4: Supports, Hangers, Fasteners UNIT 1: Supports

OPERATIONS	KNOWLEDGE
1. Locating piping and equipment	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) type, size and location of piping</li><li>(ii) location and size of equipment</li><li>(iii) special requirements</li></ul></li><li>(b) Familiarity with requirements and regulations for pipe and equipment location:<ul style="list-style-type: none"><li>(i) structural</li><li>(ii) proximity to other services</li><li>(iii) control</li><li>(iv) other</li></ul></li></ul>
2. Locating supports	<ul style="list-style-type: none"><li>(a) Type, purpose and characteristics of supports:<ul style="list-style-type: none"><li>(i) reinforced concrete</li><li>(ii) steel</li><li>(iii) masonry</li><li>(iv) wood</li></ul></li><li>(b) Interpretation of, and adherence to relevant codes for supporting:<ul style="list-style-type: none"><li>(i) underground piping and equipment</li><li>(ii) above ground piping and equipment</li></ul></li><li>(c) Considerations in the spacing of supports</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 4: Supports, Hangers, Fasteners      UNIT 1: Supports

OPERATIONS	KNOWLEDGE
3. Installing supports	<ul style="list-style-type: none"><li>(a) Procedures for laying out and spacing supports</li><li>(b) Techniques of supporting piping and equipment on:<ul style="list-style-type: none"><li>(i) filled ground/unstable soil</li><li>(ii) virgin soil</li><li>(iii) chain carriers</li></ul></li><li>(c) Importance of location of supports in relation to other services</li><li>(d) Methods of installing supports</li><li>(e) Effect of expansion and contraction of piping installed above and below ground</li><li>(f) Procedures for establishing grade of supports</li><li>(g) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to determine elevation and spacing of supports</li><li>(ii) conversion of decimal and fractional values</li><li>(iii) cubic measurement to determine volume and weight relationship</li></ul></li><li>(h) Science:<ul style="list-style-type: none"><li>(i) expansion and contraction</li><li>(ii) strength of materials</li><li>(iii) Pascal's Principle - transmission of pressure in liquids</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 4: Supports, Hangers, Fasteners UNIT 2: Hangers

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### OPERATIONS

### KNOWLEDGE

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#### 1. Selecting hangers

- (a) Interpretation of drawings and specifications to determine:
  - (i) details of building structure
  - (ii) location of pipe runs
  - (iii) location of fixtures and appurtenances
  - (iv) location of sleeves and inserts
- (b) Importance of adherence to relevant codes pertaining to use and application of hangers
- (c) Type, purpose and characteristics of hangers for:
  - (i) horizontal applications
  - (ii) vertical applications
- (d) Consideration of conditions in the use and application of hangers
- (e) Carrying capacity of hangers
- (f) Application and use of special types under extreme conditions

#### 2. Laying out

- (a) Procedures for establishing location and spacing of hangers
- (b) Importance of making necessary allowances for:
  - (i) insulation
  - (ii) pipe spacing
- (c) Considerations of positions of pipe in relation to other services
- (d) Type, purpose and use of lay-out tools and devices:
  - (i) builders level
  - (ii) plumb-bob
  - (iii) chalk line
  - (iv) measuring tapes
- (e) Mathematics:
  - linear measurement to determine elevation and spacing of supports

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 4: Supports, Hangers, Fasteners      UNIT 2: Hangers

OPERATIONS	KNOWLEDGE
3. Installing hangers	<ul style="list-style-type: none"><li>(a) Methods of installing hangers in horizontal and vertical applications</li><li>(b) Type, purpose and size of expansion shields</li><li>(c) Procedures for installing expansion shields</li><li>(d) Methods of installing fasteners using explosive charges</li><li>(e) Importance of care in the use of impact guns and explosive charges</li><li>(f) Identification of standard thread sizes</li><li>(g) Effect of galvanic corrosion on metals</li><li>(h) Type, purpose and method of installing:<ul style="list-style-type: none"><li>(i) clamps</li><li>(ii) rods</li><li>(iii) adaptors</li><li>(iv) guides</li><li>(v) anchors</li></ul></li><li>(i) Care, use and storage of:<ul style="list-style-type: none"><li>(i) dies - hand and power operated</li><li>(ii) welding and brazing equipment</li></ul></li><li>(j) Science:<ul style="list-style-type: none"><li>(i) thermal expansion and contraction</li><li>(ii) explosives</li><li>(iii) electrolysis</li><li>(iv) Pascal's Principles - pressure and liquid in pipes</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

BLOCK 4: Supports, Hangers, Fasteners UNIT 3: Fasteners

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Selecting fasteners	<ul style="list-style-type: none"><li>(a) Interpretation of handbooks and manufacturers' manuals in the selection of fasteners</li><li>(b) Interpretation and adherence of relevant codes in the use and application of fasteners</li><li>(c) Type, purpose and application of fasteners:<ul style="list-style-type: none"><li>(i) single or double expansion shields</li><li>(ii) machine screws, studs and balls</li><li>(iii) wood and/or coach screws</li><li>(iv) nail and pin</li><li>(v) self tapping metal screws</li><li>(vi) other</li></ul></li><li>(d) Holding capacities of fasteners in various metals</li><li>(e) Effect of mating fasteners with dissimilar metals</li><li>(f) Science:<ul style="list-style-type: none"><li>(i) strength and density of materials</li><li>(ii) expansion and contraction</li><li>(iii) electrolysis</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

BLOCK 4: Supports, Hangers, Fasteners      UNIT 3: Fasteners

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Installing fasteners	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) location of pipe runs</li><li>(ii) location of inserts</li><li>(iii) fastener requirements</li></ul></li><li>(b) Methods of installing fasteners in various materials</li><li>(c) Use and application of impact guns for installing fasteners</li><li>(d) Importance of care when using impact guns and explosive charges</li><li>(e) Effect of spacing and pipe or fixture weight when installing various type fasteners</li><li>(f) Importance of care in the use of scaffolds and ladders during installation</li><li>(g) Care and storage of tools and equipment</li><li>(h) Science:<ul style="list-style-type: none"><li>(i) explosives</li><li>(ii) strength of materials</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

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BLOCK 5: Drain Work

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# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Establishing elevation of sewer and drain inverts	<ul style="list-style-type: none"><li>(a) Interpretation of drawings to determine:<ul style="list-style-type: none"><li>(i) location of stacks and connections</li><li>(ii) size of drain</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Identification of bench marks or datum points</li><li>(d) Procedure for locating, setting and levelling instrument</li><li>(e) Methods of establishing levels using:<ul style="list-style-type: none"><li>(i) dumpy levels</li><li>(ii) batter boards</li></ul></li><li>(f) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to determine elevation and run</li><li>(ii) conversion of fractional and decimal values</li><li>(iii) ratio and proportion to determine intermediate levels</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Excavating and trenching	<ul style="list-style-type: none"><li>(a) Interpretation and importance of adherence to relevant trenching and excavating codes</li><li>(b) Type and characteristics of trenches and excavations for:<ul style="list-style-type: none"><li>(i) sewers</li><li>(ii) drains</li><li>(iii) other services</li></ul></li><li>(c) Methods of trenching and excavating</li><li>(d) Use, care and storage of explosives when blasting</li><li>(e) Importance of warning signs and use of safety devices to prevent personal and property damage during blasting</li><li>(f) Type, purpose and size of shoring used in trenches and excavations</li><li>(g) Procedures for the installation of:<ul style="list-style-type: none"><li>(i) sheathing</li><li>(ii) struts</li><li>(iii) wales</li><li>(iv) cleats</li><li>(v) jacks</li></ul></li><li>(h) Considerations and effects of the proximity of excavations to footings and foundations</li><li>(i) Importance of inspection of sides of excavations and trenches for cracks</li><li>(j) Hazards relating to loose sand or soil</li><li>(k) Importance of forced ventilation in trenches and excavations where noxious gases exit</li><li>(l) Methods of de-watering excavations and trenches</li><li>(m) Results of leaving tools or materials along edges of excavations</li><li>(n) Requirements for piling excavated materials</li><li>(o) Procedures for protection of public during excavation:<ul style="list-style-type: none"><li>(i) barricades</li><li>(ii) warning lights</li><li>(iii) covers</li></ul></li><li>(p) Use of ladders and lookouts in deep trenches</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Excavating and trenching (Cont'd)	(q) Procedures for backfilling trenches and excavations
	(r) Consideration in backfilling
	(i) settlement of fill and cover
	(ii) protection against freezing
	(iii) effects of using frozen fill
	(iv) effects of rocks, etc. in fill material
	(s) Importance of care when in the vicinity of powered earth moving equipment
	(t) Importance of use of personal safety devices and equipment:
	(i) hard hats
	(ii) safety shoes
	(iii) breathing devices
	(u) Science:
	(i) characteristics of soil
	(ii) strength of materials
	(iii) characteristics of gases, i.e., methane

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

OPERATIONS	KNOWLEDGE
3. Installing building sewers	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specifications to determine:<ul style="list-style-type: none"><li>(i) layout and location</li><li>(ii) size</li><li>(iii) elevation of inverts</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Interpretation of drainage terms</li><li>(d) Type of drain materials:<ul style="list-style-type: none"><li>(i) cast iron</li><li>(ii) vitrified clay</li><li>(iii) asbestos cement</li><li>(iv) bituminous fibre</li><li>(v) concrete</li><li>(vi) non-ferrous metals</li><li>(vii) plastic</li><li>(viii) duriron</li><li>(ix) others</li></ul></li><li>(e) Type, purpose and function of various drainage systems:<ul style="list-style-type: none"><li>(i) storm</li><li>(ii) sanitary</li><li>(iii) combination</li></ul></li><li>(f) Methods of joining various materials and use of special jointing compounds</li><li>(g) Selection, use and care of tools</li><li>(h) Methods of supporting drains:<ul style="list-style-type: none"><li>(i) on filled ground</li><li>(ii) on virgin soil</li><li>(iii) suspended from building structures</li></ul></li><li>(i) Effects of incorrect sizing and grading</li><li>(j) Consideration when installing sewers and drains to eliminate drain blockage due to:<ul style="list-style-type: none"><li>(i) roots</li><li>(ii) improper workmanship</li><li>(iii) debris</li><li>(iv) grease</li><li>(v) foreign material</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

OPERATIONS	KNOWLEDGE
3. Installing building sewers and drains (Cont'd)	<ul style="list-style-type: none"><li>(k) Methods of selecting and testing of pipe and fittings before installation</li><li>(l) Importance of excluding debris during construction</li><li>(m) Method of determining location of drain trench in relation to:<ul style="list-style-type: none"><li>(i) columns</li><li>(ii) foundations</li><li>(iii) walls</li></ul></li><li>(n) Importance of adherence to trenching and shoring codes</li><li>(o) Type, purpose and location of clean-outs</li><li>(p) Methods of determining grades on drains and grading drains:<ul style="list-style-type: none"><li>(i) identification of bench marks or datum points</li><li>(ii) invert elevations</li><li>(iii) converting instrument readings</li><li>(iv) calculating total grade on drains</li><li>(v) calculating grade per foot</li></ul></li><li>(q) Use of builders level in grading</li><li>(r) Method of determining size of drains for:<ul style="list-style-type: none"><li>(i) fixture discharges</li><li>(ii) pumped discharges</li><li>(iii) storm water</li><li>(iv) combined systems</li></ul></li><li>(s) Procedure for preparing drains for testing</li><li>(t) Application of the various drainage tests:<ul style="list-style-type: none"><li>(i) ball</li><li>(ii) water</li><li>(iii) air</li><li>(iv) sight inspection</li></ul></li><li>(u) Mathematics:<ul style="list-style-type: none"><li>(i) linear measure to determine location and layout</li><li>(ii) application of fractions and decimals</li><li>(iii) calculation of 45 degrees offsets</li><li>(iv) calculation of rolled offsets</li><li>(v) calculation of areas and volumes</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
<hr/>	
3. Installing building sewers and drains (Cont'd)	(v) Science: (i) composition of sewer gasses (ii) corrosion and electrolysis (iii) expansion and contraction (iv) corrosive elements in earth
4. Repairing and servicing sewers and drains	(a) Interpretation of drain plans to determine possible points of blockage (b) Method of locating drain blockage (c) Methods of cutting and inserting fittings into drain materials (d) Procedure for clearing choked drains (e) Use of drain rods, power equipment and chemicals (f) Importance of strainers and grates to exclude debris (g) Importance of location of suitable clean-outs

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
<hr/>	
5. Installing building traps	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) trap requirements</li><li>(ii) location</li><li>(iii) size</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Type, purpose and function of building traps</li><li>(d) Importance of adherence to shoring and trenching codes during construction</li><li>(e) Consideration of location of building traps:<ul style="list-style-type: none"><li>(i) inside the building</li><li>(ii) outside the building</li></ul></li><li>(f) Importance of setting the building trap level in respect to its seal</li><li>(g) Identification of and depth of seal required for different trap materials</li><li>(h) Methods of selection of pipe and fittings and inspection for defects</li><li>(i) Procedure for installing and supporting building traps:<ul style="list-style-type: none"><li>(i) on virgin soil</li><li>(ii) on filled ground</li><li>(iii) suspended from building structures</li></ul></li><li>(j) Consideration in the installation of the fresh air inlet:<ul style="list-style-type: none"><li>(i) size</li><li>(ii) connection to the drain</li><li>(iii) terminus outside of building</li><li>(iv) breather cap requirements</li></ul></li><li>(k) Method of installing clean-outs for traps located:<ul style="list-style-type: none"><li>(i) inside the building</li><li>(ii) outside the building</li></ul></li><li>(l) Importance of accessibility of clean-outs</li><li>(m) Importance of excluding debris during construction</li><li>(n) Care and use of tools</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 1: Sewers and Drains

OPERATIONS	KNOWLEDGE
5. Installing building traps (Cont'd)	<ul style="list-style-type: none"> <li>(o) Mathematics: <ul style="list-style-type: none"> <li>(i) linear measure to facilitate construction</li> <li>(ii) linear measure to determine layout</li> </ul> </li> <li>(p) Science: <ul style="list-style-type: none"> <li>(i) atmospheric pressure - positive and negative pressures</li> <li>(ii) flow of water and air in pipes</li> <li>(iii) composition of sewer gasses</li> </ul> </li> </ul>
6. Repairing and servicing building traps	<ul style="list-style-type: none"> <li>(a) Susceptibility of blockage in traps</li> <li>(b) Method of clearing blockage in traps</li> <li>(c) Type and use of drain rods and plungers</li> <li>(d) Type, purpose and use of chemicals</li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

OPERATIONS	KNOWLEDGE
7. Installing floor drains	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) layout</li><li>(ii) location</li><li>(iii) size</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Characteristics and application of:<ul style="list-style-type: none"><li>(i) simple floor drains</li><li>(ii) fixture floor drains</li></ul></li><li>(d) Considerations in the location of:<ul style="list-style-type: none"><li>(i) simple floor drains</li><li>(ii) fixture floor drains</li></ul></li><li>(e) Type, purpose and function of floor drain strainers</li><li>(f) Importance of grading floors towards floor drains</li><li>(g) Consideration of maximum and minimum grades</li><li>(h) Method of sealing floors to strainer inlets</li><li>(i) Use of builders level to establish elevation of strainers</li><li>(j) Method of supporting grating during construction to prevent misalignment</li><li>(k) Method of setting traps level in respect to their seal</li><li>(l) Procedures for venting floor drain traps</li><li>(m) Selection of pipe and fittings and method of joining</li><li>(n) Care and use of tools</li><li>(o) Methods of maintaining trap seals</li><li>(p) Procedure for connecting simple floor and fixture floor drains to building drains</li><li>(q) Importance of location of cleanouts</li><li>(r) Mathematics:<ul style="list-style-type: none"><li>(i) linear measure to determine layout and location</li><li>(ii) calculation of decimals and fractional values in determining grades and converting instrument reading</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
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7. Installing floor drains (Cont'd)	(s) Science: (i) corrosion and electrolysis (ii) composition of sewer gasses (iii) circulation of air by convection
8. Repairing and servicing floor drains	(a) Importance of maintenance of strainers in a clean and sanitary condition (b) Methods of cleaning and removing blockages from floor drains: (i) drain rods and plungers (ii) chemical cleaners



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 1: Sewers and Drains

OPERATIONS	KNOWLEDGE
9. Connecting rain water leaders, area drains and sub soil drainage tile to building drains	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specifications to determine:<ul style="list-style-type: none"><li>(i) location of rain water leaders</li><li>(ii) location of sub drainage tile</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Purpose and function of sub drainage tile and area drains</li><li>(d) Method of installing sub drainage tile:<ul style="list-style-type: none"><li>(i) outside of building</li><li>(ii) inside of building</li></ul></li><li>(e) Procedure for installing, sizing and connecting area drains</li><li>(f) Importance of providing sediment catchment at area drain inlets</li><li>(g) Possible hazards when tunneling under foundation walls</li><li>(h) Selection of and testing material for defects before construction</li><li>(i) Importance of preventing entrance of debris during construction</li><li>(j) Procedure for connecting tile, sub drainage, area drains and rain water leaders to:<ul style="list-style-type: none"><li>(i) combination drain</li><li>(ii) storm drains</li></ul></li><li>(k) Method of sizing storm drains:<ul style="list-style-type: none"><li>(i) use of rainfall charts</li><li>(ii) calculation of drainage areas</li><li>(iii) use of sizing tables</li></ul></li><li>(l) Importance of setting traps level in respect to their seal</li><li>(m) Mathematics:<ul style="list-style-type: none"><li>(i) linear measure to determine location of rain water leaders</li><li>(ii) decimal and fractional values to determine grades on storm drain</li></ul></li><li>(n) Science:<ul style="list-style-type: none"><li>(i) properties of rain and seepage water</li><li>(ii) corrosion and electrolysis</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

OPERATIONS	KNOWLEDGE
10. Installing oil and gasoline interceptors	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specifications to determine:<ul style="list-style-type: none"><li>(i) location</li><li>(ii) size</li><li>(iii) type</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Type, purpose and operation of oil interceptors:<ul style="list-style-type: none"><li>(i) manufactured type</li><li>(ii) concrete type, - single and multiple chamber</li></ul></li><li>(d) Methods of construction of concrete interceptor:<ul style="list-style-type: none"><li>(i) support of fitting during construction</li><li>(ii) importance of solid foundation</li><li>(iii) importance of location to prevent freezing</li></ul></li><li>(e) Size, purpose and installation of vents</li><li>(f) Types, purpose and location of flow control fittings</li><li>(g) Method of determining size of interceptors:<ul style="list-style-type: none"><li>importance of manufacturers specifications</li></ul></li><li>(h) Procedure for removing oil from:<ul style="list-style-type: none"><li>(i) manufactured interceptors</li><li>(ii) concrete interceptors</li><li>(iii) oil collecting tank installation</li></ul></li><li>(i) Method of connecting inlet and outlet pipes:<ul style="list-style-type: none"><li>(i) to the interceptors</li><li>(ii) to building drain</li></ul></li><li>(j) Importance of prohibiting discharges through the interceptor from:<ul style="list-style-type: none"><li>(i) rain water leaders</li><li>(ii) sub soil drainage</li><li>(iii) fixture connection</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
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10. Installing oil and gasoline interceptors (Cont'd)	(k) Mathematics: (i) linear measure to determine location, layout and piping installation (ii) areas and volumes to determine capacities of interceptor (l) Science: (i) specific gravity and density of various fluids (ii) flow rates of water (iii) circulation due to convection

AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
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11. Repairing and servicing oil and gasoline interceptors	(a) Procedure for removal of top for cleaning (b) Methods for removal of sand and sediment (c) Hazards relating to use of open flames

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
<hr/>	
12. Installing sewage sumps	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specifications to determine and identify:<ul style="list-style-type: none"><li>(i) location of sump</li><li>(ii) type of ejector</li><li>(iii) elevation</li><li>(iv) sub basements</li><li>(v) sub drains</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Type, purpose and function of sewage and drainage sumps:<ul style="list-style-type: none"><li>(i) manufactured type</li><li>(ii) constructed type</li></ul></li><li>(d) Types, function and operation of sewage and drainage pumps and ejectors:<ul style="list-style-type: none"><li>(i) centrifugal pumps</li><li>(ii) piston pumps</li><li>(iii) air displacement ejectors</li></ul></li><li>(e) Importance and method of sealing sewage pumps</li><li>(f) Importance of interval of operation of sewage pumps</li><li>(g) Requirements and method of installing single and duplex pumps:<ul style="list-style-type: none"><li>(i) valving required</li><li>(ii) siamese discharge lines</li></ul></li><li>(h) Size, function and method of installation of vents for sewage sumps</li><li>(i) Method and location of connection of discharge line to building drains with and without main traps</li><li>(j) Importance of using drainage fitting on discharge lines</li><li>(k) Method of sizing:<ul style="list-style-type: none"><li>(i) sewage sumps and pumps</li><li>(ii) discharge lines</li><li>(iii) drains for pumped discharge</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

OPERATIONS	KNOWLEDGE
12. Installing sewage sumps (Cont'd)	<ul style="list-style-type: none"><li>(1) Type, purpose and characteristics of pump controls and safety devices:<ul style="list-style-type: none"><li>(i) single pumps</li><li>(ii) duplex pumps</li><li>(iii) high water alarms</li><li>(iv) alternator controls</li></ul></li><li>(m) Methods of making electrical connections to pump controls and safety devices</li><li>(n) Method of connecting sub drains to sewage tanks</li><li>(o) Procedures for testing sub drains and sewage tanks:<ul style="list-style-type: none"><li>(i) water</li><li>(ii) ball</li><li>(iii) air</li><li>(iv) smoke</li></ul></li><li>(p) Mathematics:<ul style="list-style-type: none"><li>(i) linear measure to determine layout and location</li><li>(ii) calculation of areas and volumes to determine tank capacity</li></ul></li><li>(q) Science:<ul style="list-style-type: none"><li>(i) decomposition of sewage</li><li>(ii) composition of sewer gases</li><li>(iii) flow of water in pipe</li><li>(iv) air pressure due to velocity discharge</li><li>(v) centrifugal force</li><li>(vi) pressure and heads</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 1: Sewers and Drains

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OPERATIONS

KNOWLEDGE

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13. Repairing and servicing  
sewage sumps

- (a) Importance of checking water cooling  
to bearing brackets
- (b) Method of removing pump from sump  
for cleaning screens and impellers
- (c) Procedures for maintenance of air  
compressors
- (d) Maintenance of motors and controls
- (e) Procedure for repair of check and  
gate valves
- (f) Types of lubricants
- (g) Science:  
lubricants and their uses

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

OPERATIONS	KNOWLEDGE
14. Installing backwater valves	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specification to determine:<ul style="list-style-type: none"><li>(i) layout of drainage system</li><li>(ii) location for backwater valves</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Importance of determining the cause of back flooding:<ul style="list-style-type: none"><li>(i) undersized public sewers</li><li>(ii) partially choked public sewers</li><li>(iii) unusually heavy rains</li><li>(iv) inadequate public sewers</li></ul></li><li>(d) Effects of back flooding regarding:<ul style="list-style-type: none"><li>(i) basement foundations</li><li>(ii) sanitary conditions</li><li>(iii) spreading of disease</li></ul></li><li>(e) Type, purpose and function of back water valves:<ul style="list-style-type: none"><li>(i) flat type</li><li>(ii) float type</li></ul></li><li>(f) Factors to consider in location of back water valves:<ul style="list-style-type: none"><li>(i) type and size of building</li><li>(ii) rain water leaders, floor drains, sub drainage tile and fixtures located in the basement</li><li>(iii) the length of time the back flood condition will exist</li><li>(iv) the depth of the back flood condition</li><li>(v) the type of drainage system employed:<ul style="list-style-type: none"><li>a. combination</li><li>b. separate system</li></ul></li></ul></li><li>(g) Method of installing sewage and drainage sumps for back flood protection</li><li>(h) Importance of access to back water valves for repair and maintenance</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

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OPERATIONS	KNOWLEDGE
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14. Installing backwater valves (Cont'd)	(i) Importance of proper installation techniques to ensure air passage through the back water valves (j) Mathematics: linear measure to determine layout and installation (k) Science: water pressure
15. Repairing and servicing backwater valves	(a) Importance of periodic inspection to determine condition of back water valves (b) Replacement of parts

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 1: Sewers and Drains

OPERATIONS	KNOWLEDGE
16. Connecting blow off tanks to building drains	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specifications to determine size and location of tank</li><li>(b) Importance of adherence to relevant codes</li><li>(c) Type, purpose and function of blow off tanks</li><li>(d) Identification of tanks required for high or low pressure steam</li><li>(e) Importance of maintaining suitable discharge temperature into drainage systems</li><li>(f) Purpose, size and installation of independent vent to atmosphere</li><li>(g) Type, purpose and function of special valves:<ul style="list-style-type: none"><li>(i) blow down</li><li>(ii) quick opening and closing</li></ul></li><li>(h) Purpose of and method of connecting cold water supply to tanks</li><li>(i) Method of connecting discharge line to the building drain</li><li>(j) Importance of preventing possible cross connection</li><li>(k) Mathematics:<ul style="list-style-type: none"><li>(i) linear measure to determine roughing-in dimensions</li><li>(ii) calculations of fahrenheit and centigrade</li></ul></li><li>(l) Science:<ul style="list-style-type: none"><li>(i) British Thermal Units</li><li>(ii) latent heat of vaporization</li><li>(iii) properties of water and steam</li><li>(iv) expansion and contraction</li></ul></li></ul>
17. Repairing and servicing blow off tanks to building drains	<ul style="list-style-type: none"><li>(a) Importance of periodic inspection to determine interval of cleanout</li><li>(b) Replacement of defective parts and valves</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 2: Municipal Sewage Systems

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OPERATIONS	KNOWLEDGE
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1. Connecting building sewers to public sewers	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specification to determine:<ul style="list-style-type: none"><li>(i) location of public sewers</li><li>(ii) depth of sewer inverts</li><li>(iii) size of public sewers</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Type, purpose and characteristics of public sewers:<ul style="list-style-type: none"><li>(i) intercepting or trunk line</li><li>(ii) tributary or contributing</li></ul></li><li>(d) Construction and design of public sewers:<ul style="list-style-type: none"><li>(i) round</li><li>(ii) oval</li><li>(iii) ovoid</li></ul></li><li>(e) Materials of construction:<ul style="list-style-type: none"><li>(i) poured concrete</li><li>(ii) concrete pipe</li><li>(iii) asbestos cement</li><li>(iv) vitrified clay</li><li>(v) others</li></ul></li><li>(f) Methods of sewage treatment and disposal:<ul style="list-style-type: none"><li>(i) activated sludge process</li><li>(ii) artificial drying</li><li>(iii) lagoon systems</li></ul></li><li>(g) Consideration of methods of sludge disposal:<ul style="list-style-type: none"><li>(i) sludge drying beds</li><li>(ii) artificial drying</li><li>(iii) other methods</li></ul></li><li>(h) Chemical treatment of final effluent before leaving plant</li><li>(i) Adherence to relevant trenching and shoring codes</li><li>(j) Method of connecting similar and dissimilar sewer materials</li><li>(k) Method of expressing grading on public sewers:<ul style="list-style-type: none"><li>(i) grades per foot</li><li>(ii) percent grades</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 2: Municipal Sewage Systems

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Connecting building sewers to public sewers (Cont'd)	<ul style="list-style-type: none"><li>(l) Procedure for making connections between various building sewer material to public sewers</li><li>(m) Importance of avoiding explosions in public sewers due to:<ul style="list-style-type: none"><li>(i) sewer gases</li><li>(ii) inflammable fluids</li><li>(iii) infiltration from gas lines</li></ul></li><li>(n) Repair and maintenance responsibility of municipality</li><li>(o) Importance of adherence to recognized safety practices:<ul style="list-style-type: none"><li>(i) use of oxygen masks</li><li>(ii) introduction of air</li><li>(iii) testing for the presence of asphyxiation gas</li><li>(iv) others</li></ul></li><li>(p) Mathematics:<ul style="list-style-type: none"><li>(i) linear measure to determine layout</li><li>(ii) decimal and fractional values used in calculating grades on drains and sewers</li></ul></li><li>(q) Science:<ul style="list-style-type: none"><li>(i) principles of sewage treatment</li><li>(ii) composition of sewer gases</li><li>(iii) static electricity</li></ul></li></ul>

## BLOCK 5: Drain Work

## UNIT 3: Rural Sewage Systems

OPERATIONS	KNOWLEDGE
1. Installing septic tanks	<ul style="list-style-type: none"> <li>(a) Interpretation of drawing and specifications to determine:               <ul style="list-style-type: none"> <li>(i) location</li> <li>(ii) type of system</li> </ul> </li> <li>(b) Importance of adherence to relevant codes</li> <li>(c) Identification of a septic tank system</li> <li>(d) Effects of untreated sewage:               <ul style="list-style-type: none"> <li>(i) in natural waters</li> <li>(ii) on public health</li> <li>(iii) on wildlife</li> <li>(iv) at water treatment plants</li> </ul> </li> <li>(e) Types of septic tank systems:               <ul style="list-style-type: none"> <li>(i) single and multiple chamber trickle type</li> <li>(ii) two compartment tank with automatic syphon</li> <li>(iii) Imhoff tanks</li> <li>(iv) cesspools</li> </ul> </li> <li>(f) Characteristics of the septic process:               <ul style="list-style-type: none"> <li>(i) septic action - digestion</li> <li>(ii) bacteria action</li> <li>(iii) gasification</li> <li>(iv) sludge</li> <li>(v) scum</li> <li>(vi) suspended matter</li> <li>(vii) condition of effluent</li> </ul> </li> <li>(g) Characteristics, purpose and function of automatic syphon:               <ul style="list-style-type: none"> <li>(i) components of automatic syphon</li> <li>(ii) method of installation                   <ul style="list-style-type: none"> <li>a. setting the trap</li> <li>b. placement of bell</li> <li>c. priming of the trap</li> <li>d. rates of discharge</li> </ul> </li> <li>(iii) advantages and disadvantages of automatic syphons</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 3: Rural Sewage Systems

OPERATIONS	KNOWLEDGE
1. Installing septic tanks (Cont'd)	<ul style="list-style-type: none"><li>(h) Elements of construction and tank design:<ul style="list-style-type: none"><li>(i) shapes of tanks</li><li>(ii) number of tanks</li><li>(iii) minimum and maximum depths</li><li>(iv) scum and sludge storage</li><li>(v) minimum capacity in gallons</li><li>(vi) construction:<ul style="list-style-type: none"><li>a. poured concrete</li><li>b. steel</li><li>c. pre cast concrete</li><li>d. others</li></ul></li></ul></li><li>(i) Selection, location and placement of tank fittings</li><li>(j) Importance of providing cleanout facilities:<ul style="list-style-type: none"><li>(i) manhole covers</li><li>(ii) inspection doors and plates</li></ul></li><li>(k) Factors to consider when sizing septic tanks:<ul style="list-style-type: none"><li>(i) retention period</li><li>(ii) sludge and scum storage</li><li>(iii) garbage grinders discharge</li><li>(iv) automatic clothes and dish-washers</li><li>(v) number of persons</li><li>(vi) number of bedrooms</li><li>(vii) type of business or establishment</li><li>(viii) amount of sewage influent</li></ul></li><li>(l) Consideration of pumped discharges:<ul style="list-style-type: none"><li>(i) into septic tanks</li><li>(ii) from septic tank to disposal beds</li></ul></li><li>(m) Consideration of excluding rain water from roof and from sub drainage tile</li><li>(n) Importance of adherence to relevant shoring and trenching codes</li><li>(o) Method of supporting septic tanks on:<ul style="list-style-type: none"><li>(i) filled ground</li><li>(ii) virgin soil</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 3: Rural Sewage Systems

OPERATIONS	KNOWLEDGE
1. Installing septic tanks (Cont'd)	<ul style="list-style-type: none"><li>(p) Importance of providing protection against freezing</li><li>(q) Consideration of venting septic tanks</li><li>(r) Method of installation vents where applicable</li><li>(s) Consideration of materials detrimental to the bacterial action of septic tanks</li><li>(t) Importance of grease interception and removal from the influent</li><li>(u) Location of septic tanks:<ul style="list-style-type: none"><li>(i) minimum distances from buildings, wells, other sources of supply and property lines</li><li>(ii) under roadways</li><li>(iii) accessible for cleaning and maintenance</li></ul></li><li>(v) Factors to consider for tank elevation:<ul style="list-style-type: none"><li>(i) inlet pipe elevation</li><li>(ii) outlet pipe elevation</li><li>(iii) topography</li></ul></li><li>(w) Method of connecting various pipe materials to septic tanks</li><li>(x) Factors affecting efficiency of septic tanks</li><li>(y) Relationship of detention period to sedimentation, gasification and liquefaction</li><li>(z) Mathematics:<ul style="list-style-type: none"><li>(i) linear measure to determine layout and location</li><li>(ii) volumetric measure to determine capacities of tanks</li></ul></li><li>(aa) Science:<ul style="list-style-type: none"><li>(i) composition of sewer gases</li><li>(ii) composition of methane gas</li><li>(iii) corrosion and deterioration of concrete and steel by gases</li><li>(iv) bacterial action, aerobic and anaerobic bacteria</li><li>(v) nitrogen cycle</li><li>(vi) nitrogen compounds</li></ul></li></ul>



AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

BLOCK 5: Drain Work

UNIT 3: Rural Sewage Systems

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OPERATIONS	KNOWLEDGE
2. Repairing and servicing septic tanks	<ul style="list-style-type: none"><li>(a) Method of cleaning tanks:<ul style="list-style-type: none"><li>(i) vacuum tanks</li><li>(ii) manual removal</li><li>(iii) sludge pumps</li></ul></li><li>(b) Methods of sludge disposal:<ul style="list-style-type: none"><li>(i) drying beds</li><li>(ii) artificial dryers</li><li>(iii) land fill</li><li>(iv) fertilizer</li></ul></li><li>(c) Use of chemicals as septic action starters and conditioners</li></ul>

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# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 3: Rural Sewage Systems

OPERATIONS	KNOWLEDGE
3. Installing disposal fields	<ul style="list-style-type: none"> <li>(a) Interpretation of drawing and specifications to determine:               <ul style="list-style-type: none"> <li>(i) layout</li> <li>(ii) location</li> </ul> </li> <li>(b) Importance of adherence to relevant codes</li> <li>(c) Identification of disposal bed systems and components</li> <li>(d) Effects of untreated sewage being discharged indiscriminately</li> <li>(e) Determining suitability of soil for disposal fields:               <ul style="list-style-type: none"> <li>(i) depth of ground water table below the surface</li> <li>(ii) rock formations close to the surface</li> </ul> </li> <li>(f) Percolation tests to determine soil porosity</li> <li>(g) Method of boring test holes</li> <li>(h) Use of well drillers logs to determine type and condition of soil</li> <li>(i) Procedure for percolation tests:               <ul style="list-style-type: none"> <li>(i) number and location of tests</li> <li>(ii) size and depth of test holes</li> <li>(iii) preparing test holes</li> <li>(iv) saturation and swelling of the soil</li> <li>(v) percolation - rate measurements</li> </ul> </li> <li>(j) Use of charts to determine required absorption area</li> <li>(k) Type, purpose and function of leaching systems:               <ul style="list-style-type: none"> <li>(i) standard trenches</li> <li>(ii) seepage pits</li> </ul> </li> <li>(l) Variations in design and layout of leaching systems:               <ul style="list-style-type: none"> <li>(i) consideration of the shape and size of disposal area</li> <li>(ii) topography</li> </ul> </li> <li>(m) Location of seepage pits and disposal system from:               <ul style="list-style-type: none"> <li>(i) wells and other water supply</li> <li>(ii) property lines</li> <li>(iii) buildings</li> <li>(iv) location regarding roadways</li> <li>(v) trees</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 3: Rural Sewage Systems

OPERATIONS	KNOWLEDGE
3. Installing disposal fields (Cont'd)	<ul style="list-style-type: none"><li>(n) Consideration of distances in various types of soil</li><li>(o) Selection of pipe and fittings for use in disposal fields</li><li>(p) Method of joining the various pipe materials</li><li>(q) Factors to consider in trench construction:<ul style="list-style-type: none"><li>(i) depth and width of trench</li><li>(ii) maximum length of laterals</li><li>(ii) minimum and maximum grades on trenches</li><li>(iv) minimum spacing of laterals</li></ul></li><li>(r) Importance of avoiding smearing and compacting trench bottom</li><li>(s) Method of installing weeping tile:<ul style="list-style-type: none"><li>(i) depth of aggregate below and above tile bed</li><li>(ii) joint spacing when weeping tile is used</li><li>(iii) use of drain tile connectors, collars, clips and spacers</li><li>(iv) joint covering</li><li>(v) consideration of maximum and minimum grades</li><li>(vi) covering of aggregate before backfilling the trench with earth</li><li>(vii) importance of overfilling of trench</li></ul></li><li>(t) Consideration in venting of disposal beds</li><li>(u) Type, purpose and function of distribution boxes</li><li>(v) Design and construction of distribution boxes</li><li>(w) Factors to consider in the installing of distribution boxes:<ul style="list-style-type: none"><li>(i) importance of levelling</li><li>(ii) number of outlets required</li></ul></li><li>(x) Method of installing disposal beds on sloping ground:<ul style="list-style-type: none"><li>(i) special methods</li><li>(ii) use of distribution box</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 5: Drain Work

### UNIT 3: Rural Sewage Systems

OPERATIONS	KNOWLEDGE
3. Installing disposal fields (Cont'd)	(y) Type, purpose and function of seepage pits: (i) advantages and disadvantages (ii) methods of construction (z) Importance of protecting against freezing (aa) Method of and inspection to specifications of relevant codes (bb) Mathematics: linear measure to determine: layout and location, lengths, widths, depths, and absorption area (cc) Science: (i) composition of sewer gases (ii) composition of methane gas (iii) bacterial action: anaerobic-aerobic (iv) nitrogen cycle (v) capillary attraction (vi) evaporation
4. Repairing and servicing disposal fields	(a) Techniques of preventative maintenance of septic tank (b) Consideration and condition of root growth (c) Method of removing roots (d) Effect and methods of preventing earth infiltrating drain tile (e) Importance of preventing heavy vehicles running over disposal beds

AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

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BLOCK 6: Stacks, Wastes and Vents

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# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Laying - out for and installing sleeves and inserts	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) location of stacks</li><li>(ii) size of stacks</li></ul></li><li>(b) Type, purpose and function of sleeves:<ul style="list-style-type: none"><li>(i) manufactured sleeves</li><li>(ii) made-up sleeves</li></ul></li><li>(c) Selection of sleeves for various size of pipe</li><li>(d) Method of making sleeves for various sizes of pipe</li><li>(e) Procedure to establish location of sleeves</li><li>(f) Method of fastening sleeves to forms</li><li>(g) Method of installing and fastening wall sleeves</li><li>(h) Type and purpose of sleeve filling material for winter and/or summer use:<ul style="list-style-type: none"><li>(i) sand</li><li>(ii) paper</li><li>(iii) sawdust</li><li>(iv) small stones</li></ul></li><li>(i) Type, purpose and function of inserts:<ul style="list-style-type: none"><li>(i) fixed</li><li>(ii) adjustable</li><li>(iii) continuous</li></ul></li><li>(j) Method of locating and installing inserts</li><li>(k) Use of chalk lines for lining up sleeves and inserts</li><li>(l) Use of plumb-bob for locating sleeves and inserts in multi-storey building</li><li>(m) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement for layout</li><li>(ii) pythagorean theorem</li><li>(3-4-5 rule) for layout</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

OPERATIONS	KNOWLEDGE
2. Installing stack footings	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specification to determine:<ul style="list-style-type: none"><li>(i) location of footings</li><li>(ii) size of footings</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Type, purpose and function of footings</li><li>(d) Selection of pipe and fittings for footing</li><li>(e) Methods of connecting stack footings to non-ferrous drain material:<ul style="list-style-type: none"><li>(i) to asbestos cement</li><li>(ii) to bituminous fibre</li><li>(iii) to vitrified clay</li><li>(iv) to cement pipe</li><li>(v) to plastic</li></ul></li><li>(f) Procedure for connecting 3 inch footings to 4 inch drain materials</li><li>(g) Hazards encountered when fitting vitrified tile tapers</li><li>(h) Procedure to follow in assembly of the footing</li><li>(i) Procedure to establish grade on footing</li><li>(j) Selection, care and use of tools required to install footings</li><li>(k) Method of supporting stack footings</li><li>(l) Mathematics:<ul style="list-style-type: none"><li>linear measure to determine<ul style="list-style-type: none"><li>a. lengths and sizes</li><li>b. depth of footing below floor level</li></ul></li></ul></li><li>(m) Science:<ul style="list-style-type: none"><li>characteristics and composition of:<ul style="list-style-type: none"><li>a. cement</li><li>b. ceramics</li><li>c. plastics</li><li>d. fibre</li></ul></li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

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### OPERATIONS

### KNOWLEDGE

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- |                                     |   |
|-------------------------------------|---|
| 3. Installing soil and waste stacks | <ul style="list-style-type: none"><li>(a) Interpretation of drawing and specifications to determine:<ul style="list-style-type: none"><li>(i) location of stacks</li><li>(ii) size of stacks</li><li>(iii) materials required for stacks</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Types, purpose, function and identification of stacks</li><li>(d) Selection and identification of allowable fittings</li><li>(e) Prohibited fittings and practices</li><li>(f) Selection of, and methods of joining various pipe materials</li><li>(g) Procedure for cutting and finishing holes in wood, concrete, masonry and plastic to accommodate stacks</li><li>(h) Selection, care and use of tools required to install stacks</li><li>(i) Importance of coordinating activities with other trades</li><li>(j) Selection and care in the use of scaffolds and ladders</li><li>(k) Procedure to follow in the installation of offsets in stacks</li><li>(l) Hazards encountered when connecting fixtures at the base of stacks</li><li>(m) Methods of preventing detergent foam from backing through traps on lower floors</li><li>(n) Effects of pressures in stacks</li><li>(o) Types and location of cleanouts for stacks</li><li>(p) Purpose and method of relief venting stacks installed in multi-storey building</li><li>(q) Requirement and method of sizing stacks:<ul style="list-style-type: none"><li>(i) hydraulic loads</li><li>(ii) fixture units</li></ul></li></ul> |
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# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

OPERATIONS	KNOWLEDGE
3. Installing soil and waste stacks (Cont'd)	<ul style="list-style-type: none"> <li>(r) Procedures to follow when checking pipe and fittings for defects</li> <li>(s) Method of construction and installation of stacks</li> <li>(t) Procedures for protection of stack openings to prevent entrance of debris during construction</li> <li>(u) Methods of prefabrication of components</li> <li>(v) Procedures for using plumb-bob and level in plumbing and aligning stacks</li> <li>(w) Requirements and methods of supporting:               <ul style="list-style-type: none"> <li>(i) vertical sections of stacks</li> <li>(ii) horizontal sections of stacks</li> </ul> </li> <li>(x) Procedure for testing stacks:               <ul style="list-style-type: none"> <li>(i) preparation of system for testing</li> <li>(ii) water testing</li> <li>(iii) air testing</li> </ul> </li> <li>(y) Mathematics:               <ul style="list-style-type: none"> <li>(i) linear measure to determine location of stacks</li> <li>(ii) calculation to determine acceleration due to gravity</li> </ul> </li> <li>(z) Science:               <ul style="list-style-type: none"> <li>(i) air pressure</li> <li>(ii) positive and negative pressures</li> <li>(iii) electrolysis and corrosion</li> <li>(iv) acceleration and gravity</li> </ul> </li> </ul>
4. Repairing and servicing soil and waste stacks	<ul style="list-style-type: none"> <li>(a) Method of cutting fittings into stacks of various materials</li> <li>(b) Protection against freezing</li> <li>(c) Use of drain rods and chemicals for clearing stoppage</li> <li>(d) Procedures used in thawing stacks and waste pipe</li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

OPERATIONS	KNOWLEDGE
5. Installing flashings on stack terminals	<ul style="list-style-type: none"> <li>(a) Interpretation of drawing and specifications to determine:               <ul style="list-style-type: none"> <li>(i) location of flashings</li> <li>(ii) material required</li> </ul> </li> <li>(b) Importance of adherence to relevant codes</li> <li>(c) Type, purpose and characteristics of flashings:               <ul style="list-style-type: none"> <li>(i) hub</li> <li>(ii) sleeve</li> <li>(iii) manufactured flashings</li> </ul> </li> <li>(d) Materials used in construction of flashings:               <ul style="list-style-type: none"> <li>(i) lead</li> <li>(ii) copper</li> <li>(iii) neoprene</li> </ul> </li> <li>(e) Methods of flashing:               <ul style="list-style-type: none"> <li>(i) flat roof</li> <li>(ii) pitched roof</li> <li>(iii) shingled roof</li> <li>(iv) slate roof</li> <li>(v) other material</li> </ul> </li> <li>(f) Method of dressing lead flashing</li> <li>(g) Procedure to follow when using:               <ul style="list-style-type: none"> <li>(i) ladders on roof</li> <li>(ii) scaffolds on roof</li> <li>(iii) hand line</li> <li>(iv) ropes and slings</li> </ul> </li> <li>(h) Hazard when carrying molten lead up to roof</li> <li>(i) Selection, use and care of tools required for flashing</li> <li>(j) Mathematics:               <ul style="list-style-type: none"> <li>(i) linear measure to determine location of roof terminal</li> <li>(ii) Geometry for sheet metal layout</li> </ul> </li> <li>(k) Science:               <ul style="list-style-type: none"> <li>(i) metallurgy - work hardening and annealing</li> <li>(ii) plastics</li> </ul> </li> </ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

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### OPERATIONS

### KNOWLEDGE

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6. Installing horizontal branches and fixture waste pipes

- (a) Interpretation of drawing and specification to determine:
  - (i) location of fixtures
  - (ii) sizes of pipe
  - (iii) pipe material required
- (b) Importance of adherence to relevant codes
- (c) Type, purpose and function of the various plumbing systems:
  - (i) conventional systems
  - (ii) durham systems
- (d) Interpretation of manufacturers' catalogue to determine:
  - (i) roughing-in measurements
  - (ii) fixture dimensions
- (e) Requirements for and method of determining the size of:
  - (i) horizontal waste pipes
  - (ii) vertical waste pipes
  - (iii) fixture drains
- (f) Method of grading and minimum grades required
- (g) Selection of fittings for:
  - (i) horizontal waste pipes
  - (ii) vertical waste pipes
- (h) Method of connecting:
  - (i) horizontal to vertical pipe
  - (ii) vertical to horizontal pipe
- (i) Selection of, and method of joining different waste pipe materials
- (j) Selection, care and use of tools required to install waste pipes
- (k) Methods of cutting and finishing holes in:
  - (i) wood
  - (ii) concrete
  - (iii) masonry
  - (iv) plaster
- (l) Method of rigging:
  - (i) ladders
  - (ii) scaffolds
  - (iii) ropes and slings
- (m) Method of construction and installation of waste pipes

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

OPERATIONS	KNOWLEDGE
6. Installing horizontal branches and fixture waste pipes (Cont'd)	<ul style="list-style-type: none"> <li>(n) Requirements and method of supporting:                             <ul style="list-style-type: none"> <li>(i) vertical waste pipes</li> <li>(ii) horizontal waste pipes</li> </ul> </li> <li>(o) Method of cutting fittings into the various waste pipe materials</li> <li>(p) Mathematics:                             <ul style="list-style-type: none"> <li>(i) linear measure to determine layout</li> <li>(ii) pythagorean theorem (3-4-5 rule for establishing right angle</li> </ul> </li> <li>(q) Science:                             <ul style="list-style-type: none"> <li>(i) hydraulic gradient</li> <li>(ii) gravity flow of water</li> <li>(iii) concrete</li> <li>(iv) masonry</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

OPERATIONS	KNOWLEDGE
7. Installing fixture traps	<ul style="list-style-type: none"> <li>(a) Interpretation of drawings and specifications to determine: <ul style="list-style-type: none"> <li>(i) location of traps</li> <li>(ii) size of traps</li> </ul> </li> <li>(b) Importance of adherence to relevant codes</li> <li>(c) Type, purpose and characteristics of traps: <ul style="list-style-type: none"> <li>(i) P traps</li> <li>(ii) drum traps</li> <li>(iii) special designs</li> </ul> </li> <li>(d) Identification of components of traps</li> <li>(e) Causes and effect of trap seal loss: <ul style="list-style-type: none"> <li>(i) syphonage</li> <li>(ii) back pressure</li> <li>(iii) capillary attraction</li> <li>(iv) oscillation</li> <li>(v) aspiration</li> <li>(vi) momentum</li> <li>(vii) damage to the body</li> </ul> </li> <li>(f) Identification of trap seals</li> <li>(g) Method of measuring trap seals</li> <li>(h) Determining location of traps in regards to fixtures</li> <li>(i) Requirements for trap cleanouts: <ul style="list-style-type: none"> <li>(i) location and size of fixture trap cleanouts</li> <li>(ii) location of cleanouts for concealed traps</li> </ul> </li> <li>(j) Method of connecting traps: <ul style="list-style-type: none"> <li>(i) to plumbing fixtures</li> <li>(ii) to various types of waste pipe material</li> </ul> </li> <li>(k) Requirements for protecting traps from freezing</li> <li>(l) Methods of supporting traps</li> <li>(m) Mathematics: <ul style="list-style-type: none"> <li>linear measure to determine layout</li> </ul> </li> <li>(n) Science: <ul style="list-style-type: none"> <li>(i) air pressure</li> <li>(ii) principles of syphonage</li> <li>(iii) principles of aspiration</li> <li>(iv) principles of momentum - kinetic and potential energy</li> <li>(v) corrosion and electrolysis</li> <li>(vi) chemical and physical properties of water</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

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OPERATIONS	KNOWLEDGE
<hr/>	
8. Repairing and servicing fixture traps	(a) Hazards encountered in the use of drain clearing chemicals (b) Procedure to follow in use of drain rods (c) Opening and dismantling traps

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

OPERATIONS	KNOWLEDGE
9. Installing grease traps	<ul style="list-style-type: none"> <li>(a) Interpretation of drawings and specifications to determine: <ul style="list-style-type: none"> <li>(i) location of grease traps</li> <li>(ii) size of grease traps</li> </ul> </li> <li>(b) Importance of adherence to relevant codes</li> <li>(c) Type, purpose and function of grease traps: <ul style="list-style-type: none"> <li>(i) manufactured traps</li> <li>(ii) made up traps</li> </ul> </li> <li>(d) Principles of operation</li> <li>(e) Dangers involved when water cooled traps are installed</li> <li>(f) Selection of pipe materials, fittings and method of joining</li> <li>(g) Selection, care and use of tools</li> <li>(h) Factors to consider when sizing grease traps</li> <li>(i) Type, purpose and function of flow control fittings</li> <li>(j) Purpose of grease trap and interceptor vents</li> <li>(k) Method of locating, installing and venting grease traps when installed as: <ul style="list-style-type: none"> <li>(i) a fixture trap</li> <li>(ii) an interceptor</li> </ul> </li> <li>(l) Method of installing and venting flow control fittings</li> <li>(m) Selection of and methods of connecting various types of pipe to the trap</li> <li>(n) Methods of supporting suspended traps</li> <li>(o) Mathematics: <ul style="list-style-type: none"> <li>(i) linear measure to determine layout</li> <li>(ii) cubic measure to determine volume</li> </ul> </li> <li>(p) Science: <ul style="list-style-type: none"> <li>(i) frictional losses</li> <li>(ii) density and specific gravity</li> <li>(iii) liquid flow in pipes</li> <li>(iv) cooling and heat transmission</li> </ul> </li> </ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 1: Stacks and Wastes

OPERATIONS	KNOWLEDGE
10. Installing chair carriers	<ul style="list-style-type: none"> <li>(a) Interpretation of drawings and specifications to determine:               <ul style="list-style-type: none"> <li>(i) layout</li> <li>(ii) location</li> </ul> </li> <li>(b) Interpretation of manufacturers specifications and catalogues to determine roughing-in procedures</li> <li>(c) Type, purpose and characteristics of chair carriers:               <ul style="list-style-type: none"> <li>(i) closet carriers and fittings</li> <li>(ii) close closet carriers and fittings</li> <li>(iii) residential closet carriers and fittings</li> <li>(iv) urinal carriers and fittings</li> <li>(v) lavatory and sink carriers</li> <li>(vi) hospital fixture carriers and fittings</li> <li>(vii) wall type carriers</li> </ul> </li> <li>(d) Identification of fittings used for chair carrier installation:               <ul style="list-style-type: none"> <li>(i) vertical fittings</li> <li>(ii) horizontal fittings</li> <li>(iii) left and right hand fittings</li> <li>(iv) double fittings</li> </ul> </li> <li>(e) Installation features of carriers:               <ul style="list-style-type: none"> <li>(i) reversible carrier plates</li> <li>(ii) adjustable extension</li> <li>(iii) reversible foot</li> <li>(iv) vandal proof fittings</li> </ul> </li> <li>(f) Method of attaching carriers to:               <ul style="list-style-type: none"> <li>(i) concrete construction</li> <li>(ii) frame construction</li> </ul> </li> <li>(g) Procedures for use of chalk line and level for alignment of carriers</li> <li>(h) Importance of protection of stud and adapter threads from damage during construction</li> <li>(i) Mathematics:               <ul style="list-style-type: none"> <li>linear measure to determine layout and roughing-in locations</li> </ul> </li> <li>(j) Science:               <ul style="list-style-type: none"> <li>(i) concrete</li> <li>(ii) corrosion and electrolysis</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 2: Vents

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Preparing for the installation of vents	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specification to determine:<ul style="list-style-type: none"><li>(i) layout of fixtures</li><li>(ii) location of vent stacks</li><li>(iii) sizes of vent stacks and branches</li></ul></li><li>(b) Importance of adherence to relevant codes regarding:<ul style="list-style-type: none"><li>(i) materials</li><li>(ii) sizes</li><li>(iii) methods</li></ul></li><li>(c) Type, purpose and characteristics of vents:<ul style="list-style-type: none"><li>(i) individual</li><li>(ii) group</li></ul></li><li>(d) Regulations to observe in venting:<ul style="list-style-type: none"><li>(i) installed inside of building</li><li>(ii) installed outside of building</li></ul></li><li>(e) Selection of and joining the various pipe and fitting materials</li><li>(f) Method of cutting crooked threads</li><li>(g) Importance of using eccentric couplings when changing size on horizontal</li><li>(h) Prohibited types of vents:<ul style="list-style-type: none"><li>(i) crown venting</li><li>(ii) dead end venting</li></ul></li><li>(i) Importance of correct grading</li><li>(j) Method of sizing individual vent pipes and branches, and sizing trunk vent stacks</li><li>(k) Consideration of maximum desirable developed length of vent pipes</li><li>(l) Method of supporting vents:<ul style="list-style-type: none"><li>(i) horizontally</li><li>(ii) vertically</li></ul></li><li>(m) Method and technique of cutting holes and notching in:<ul style="list-style-type: none"><li>(i) wood</li><li>(ii) concrete</li><li>(iii) steel</li></ul></li><li>(n) Prohibited joints, fittings, connections and practices</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 2: Vents

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OPERATIONS	KNOWLEDGE
1. Preparing for the installation of vents (Cont'd)	<ul style="list-style-type: none"><li>(o) Mathematics:<ul style="list-style-type: none"><li>(i) linear measure to determine developed length of vents</li><li>(ii) layout and location of vents</li></ul></li><li>(p) Science:<ul style="list-style-type: none"><li>(i) measurement of atmospheric pressure</li><li>(ii) composition of air</li><li>(iii) acceleration due to gravity</li><li>(iv) composition of gases</li><li>(v) electrolysis and corrosion</li><li>(vi) expansion and contraction</li><li>(vii) hydraulic gradient</li></ul></li></ul>

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# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 2: Vents

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### OPERATIONS

### KNOWLEDGE

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#### 2. Locating vent terminals

- (a) Interpretation of drawings and specification to determine:
  - (i) location of terminals
  - (ii) material required
  - (iii) size
- (b) Importance of adherence to relevant codes regarding:
  - (i) size
  - (ii) location
  - (iii) distances and heights of terminal from windows and openings
- (c) Factors to consider when locating terminals:
  - (i) prevailing winds
  - (ii) north or south side of roof re-freezing
  - (iii) effects of roof terminals on the finished appearance of a building
  - (iv) consideration of adjacent buildings
- (d) Method of locating terminals on flat roof used for purposes other than normal weather projection
- (e) Method of terminating vent stacks through the outside walls of buildings
- (f) Method of preventing freezing in winter:
  - (i) sizing, considering geographic location
  - (ii) keeping length of pipe above the roof as short as possible
  - (iii) insulating
- (g) Importance of using plumb-bob for locating terminal holes in roof
- (h) Method of cutting holes in flashing vent terminal on:
  - (i) cedar shingles
  - (ii) asphalt shingles
  - (iii) slate roof
  - (iv) metal roof
- (i) Selection and use of increasers and reducers for connecting different types of material together

AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 2: Vents

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Locating vent terminals (Cont'd)	(j) Methods of selection and joining various pipe materials and fittings
	(k) Mathematics: linear measure to determine location and layout
	(l) Science:
	(i) transfer of heat - conduction, convection and radiation
	(ii) properties of water:
	a. freezing points
	b. rate of expansion when freezing
	c. corrosion and electrolysis



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 2: Vents

OPERATIONS	KNOWLEDGE
3. Installing venting systems	<ul style="list-style-type: none"><li>(a) Interpretation of drawing and specification to determine:<ul style="list-style-type: none"><li>(i) location of fixtures</li><li>(ii) location of vent stacks</li><li>(iii) type of vent system</li></ul></li><li>(b) Importance of adherence to relevant codes</li><li>(c) Identification of and methods of sizing and installing:<ul style="list-style-type: none"><li>(i) back vents</li><li>(ii) continuous waste and vents</li><li>(iii) dual vents</li><li>(iv) stack vents</li><li>(v) wet vents</li><li>(vi) loop and circuit vents</li><li>(vii) relief vents</li><li>(viii) yoke vents</li></ul></li><li>(d) Consideration of and method of connecting and sizing:<ul style="list-style-type: none"><li>(i) sewage sump vents</li><li>(ii) grease interceptor vents</li><li>(iii) gasoline and oil interceptor vents</li><li>(iv) blow down tank vent</li></ul></li><li>(e) Importance of and method of installing drip line to drain dead end vents</li><li>(f) Method and purpose of connecting a fixture waste at the base of vent stacks, loop and circuit vents, relief and yoke vents</li><li>(g) Selection and method of joining various and different materials together:<ul style="list-style-type: none"><li>(i) underground</li><li>(ii) above ground</li></ul></li><li>(h) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to determine maximum developed lengths of vent piping</li><li>(ii) calculation of areas and volumes to determine cross sectional areas of vent pipe</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 2: Vents

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OPERATIONS	KNOWLEDGE
3. Installing venting systems (Cont'd)	(i) Science: (i) effect of corrosive gases (ii) corrosion and electrolysis (iii) circulation by convection

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# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 3: Leaders

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing rain water leaders	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) material of construction</li><li>(ii) location of leaders and hoppers</li><li>(iii) size of leaders</li></ul></li><li>(b) Type, purpose and characteristics of leaders</li><li>(c) Location of leaders:<ul style="list-style-type: none"><li>(i) inside of buildings</li><li>(ii) outside of buildings</li></ul></li><li>(d) Selection of pipe and fittings for construction:<ul style="list-style-type: none"><li>(i) inside the building</li><li>(ii) outside the building</li></ul></li><li>(e) Type, purpose and function of roof hoppers and gutters</li><li>(f) Type, purpose and location of expansion joints</li><li>(g) Method of sizing rain water leaders:<ul style="list-style-type: none"><li>(i) interpretation of rainfall charts</li><li>(ii) calculation of projected roof area</li><li>(iii) interpretation of sizing tables</li></ul></li><li>(h) Method of connecting leaders to:<ul style="list-style-type: none"><li>(i) a storm drain</li><li>(ii) a sanitary drain</li></ul></li><li>(i) Methods of installing and purpose of rain water traps</li><li>(j) Considerations and identification of location of cleanouts</li><li>(k) Selection, use and care of tools</li><li>(l) Methods of cutting and finishing holes in:<ul style="list-style-type: none"><li>(i) wood</li><li>(ii) concrete</li><li>(iii) steel</li><li>(iv) brick</li><li>(v) block</li></ul></li><li>(m) Methods of joining pipe and fittings of the various materials</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 6: Stacks, Wastes and Vents

UNIT 3: Leaders

OPERATIONS	KNOWLEDGE
1. Installing rain water leaders (Cont'd)	<ul style="list-style-type: none"> <li>(n) Methods of supporting various pipe materials: <ul style="list-style-type: none"> <li>(i) vertically</li> <li>(ii) horizontally</li> </ul> </li> <li>(o) Method of installing and water-proofing roof hoppers on: <ul style="list-style-type: none"> <li>(i) asphalt roof</li> <li>(ii) pre cast roof</li> <li>(iii) metallic roof</li> </ul> </li> <li>(p) Mathematics: <ul style="list-style-type: none"> <li>(i) linear measure to determine location and layout</li> <li>(ii) calculation to determine roof areas</li> </ul> </li> <li>(q) Science: <ul style="list-style-type: none"> <li>(i) corrosion and electrolysis</li> <li>(ii) expansion and contraction</li> <li>(iii) concrete</li> <li>(iv) masonry</li> </ul> </li> </ul>

AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

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BLOCK 7: Water Supply Systems

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## - ROUGHING-IN -

BLOCK 7: Water Supply Systems

UNIT 1: Main Supply

OPERATIONS	KNOWLEDGE
1. Connecting to municipal water main, (service connection)	<ul style="list-style-type: none"> <li>(a) Interpretation of drawings and specifications to determine:               <ul style="list-style-type: none"> <li>(i) type and size of pipe</li> <li>(ii) location of supply</li> <li>(iii) importance of location of entry of service into building</li> </ul> </li> <li>(b) Adherence to relevant codes</li> <li>(c) Customary materials for service connection:               <ul style="list-style-type: none"> <li>(i) brass</li> <li>(ii) copper</li> <li>(iii) cast iron</li> <li>(iv) lead</li> <li>(v) steel</li> <li>(vi) plastic</li> </ul> </li> <li>(d) Identification of pipe:               <ul style="list-style-type: none"> <li>(i) weight per foot</li> <li>(ii) cast-in marking</li> <li>(iii) stamped identations</li> <li>(iv) wall thickness</li> <li>(v) colour coding</li> </ul> </li> <li>(e) Considerations when locating service below ground:               <ul style="list-style-type: none"> <li>(i) frost penetration</li> <li>(ii) soil stability</li> <li>(iii) proximity of other services</li> <li>(iv) configuration of pipe</li> <li>(v) number of joints</li> </ul> </li> <li>(f) Types of joint used when connecting specific service to source of supply:               <ul style="list-style-type: none"> <li>(i) threaded</li> <li>(ii) caulked</li> <li>(iii) capillary solder</li> <li>(iv) flared</li> <li>(v) wiped solder</li> <li>(vi) mechanical</li> </ul> </li> <li>(g) Type, purpose and characteristics of main control valves:               <ul style="list-style-type: none"> <li>(i) gate valve</li> <li>(ii) inverted key stop &amp; drain</li> <li>(iii) compression stop &amp; drain</li> </ul> </li> <li>(h) Methods of drilling &amp; tapping water mains under pressure</li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply Systems

UNIT 1: Main Supply

OPERATIONS	KNOWLEDGE
1. Connecting to municipal water main, (service connection) (Cont'd)	<ul style="list-style-type: none"><li>(i) Method of installation of curb valve at street line</li><li>(j) Considerations for location of main control valves:<ul style="list-style-type: none"><li>(i) accessibility</li><li>(ii) maintenance</li><li>(iii) frost protection</li></ul></li><li>(k) Considerations when installing main supply valves:<ul style="list-style-type: none"><li>(i) direction of flow</li><li>(ii) insuring freedom from defects</li></ul></li><li>(l) Conditions requiring the construction of a meter chamber:<ul style="list-style-type: none"><li>(i) at street line</li><li>(ii) at building</li></ul></li><li>(m) Type, purpose and function of water meters</li><li>(n) Importance of a by-pass on meter</li><li>(o) Methods of trench excavation</li><li>(p) Importance of adherence to relevant trenching codes</li><li>(q) Methods of back-filling and consolidating</li><li>(r) Importance of excluding dirt and debris from pipes during installation</li><li>(s) Importance of protecting plastic service pipes from hot water back-up</li><li>(t) Procedures for testing main supply pipe:<ul style="list-style-type: none"><li>(i) type of test</li><li>(ii) duration</li></ul></li><li>(u) Type, purpose and use of test equipment</li><li>(v) Evaluation of test with reference to relevant codes</li><li>(w) Importance of care in back-filling trenches:<ul style="list-style-type: none"><li>(i) methods of compacting fill around pipe</li><li>(ii) safe-guarding against stress or movement</li><li>(iii) backfill material devoid of deleterious or corrosive matter</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply Systems

UNIT 1: Main Supply

OPERATIONS	KNOWLEDGE
1. Connecting to municipal water main, (service connection) (Cont'd)	<ul style="list-style-type: none"> <li>(x) Methods of supporting service pipes:               <ul style="list-style-type: none"> <li>(i) on virgin soil</li> <li>(ii) on filled ground</li> <li>(iii) through walls</li> </ul> </li> <li>(y) Methods of installing anchors on water service main pipe at point of entry to building</li> <li>(z) Mathematics:               <ul style="list-style-type: none"> <li>(i) linear measurement to determine depth and run</li> <li>(ii) to determine quantities</li> <li>(iii) to determine pipe capacities</li> </ul> </li> <li>(aa) Science:               <ul style="list-style-type: none"> <li>(i) water purification</li> <li>(ii) water pressure and its measurement</li> <li>(iii) hydrodynamics</li> <li>(iv) specific gravity</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 7: Water Supply Systems

### UNIT 1: Main Supply

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#### OPERATIONS

#### KNOWLEDGE

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#### 2. Installing water meters

- (a) Type purpose and characteristics of meters:
  - (i) displacement
  - (ii) current
  - (iii) compound
  - (iv) fire line compound
  - (v) turbine
  - (vi) venturi
- (b) Selection of type and size of meter based on:
  - (i) water main pressure
  - (ii) head loss through pipes, valves, etc.
  - (iii) number of fixtures
  - (iv) building use
  - (v) flow recorder
- (c) Methods of installing water meters with:
  - (i) union couplings
  - (ii) flanged connections
  - (iii) by-pass provisions
- (d) Importance of installation methods in facilitating:
  - (i) proper support
  - (ii) accessibility for taking readings
  - (iii) removal and repairs
- (e) Technique for frost protection in the displacement type meter
- (f) Methods of operation of gear train
- (g) Importance of permanent type oil seal
- (h) Methods of adaptation of gear ratio in calibrating consumption in:
  - (i) cubic feet
  - (ii) gallons
- (i) Procedures for reading meters with:
  - (i) dials and indice hands
  - (ii) straight reading register
  - (iii) previous reading recordings
- (j) Method and use of test dial in determining precision measurement of meter

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 7: Water Supply Systems

### UNIT 1: Main Supply

OPERATIONS	KNOWLEDGE
2. Installing water meters (Cont'd)	<ul style="list-style-type: none"> <li>(k) Methods of shop testing meters with:               <ul style="list-style-type: none"> <li>(i) calibrated tube</li> <li>(ii) calibrated tanks</li> </ul> </li> <li>(l) Procedures for field testing large meters with use of:               <ul style="list-style-type: none"> <li>(i) portable test meters</li> <li>(ii) test meter and orifice plates</li> </ul> </li> <li>(m) Initial testing of meter for sensitivity to .25 G.P.M. flow rate</li> <li>(n) Importance of protection of meter due to:               <ul style="list-style-type: none"> <li>(i) back flow</li> <li>(ii) frost damage</li> <li>(iii) falling objects</li> </ul> </li> <li>(o) Importance of:               <ul style="list-style-type: none"> <li>(i) anti-tampering devices</li> <li>(ii) absence of branch openings between street main and meter</li> <li>(iii) precautions effecting electrical grounding</li> <li>(iv) displacement type meters in level position</li> </ul> </li> <li>(p) Science:               <ul style="list-style-type: none"> <li>(i) ratio and proportion</li> <li>(ii) venturi principle</li> </ul> </li> </ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 7: Water Supply Systems

### UNIT 2: Cold Water Supply

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing cold water supply pipes in building	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) location and elevation of main supply pipe</li><li>(ii) lowest points of system</li><li>(iii) location of branches and risers</li><li>(iv) all connections to:<ul style="list-style-type: none"><li>a. fixtures</li><li>b. fire lines</li><li>c. heating units</li><li>d. hot water storage tanks</li><li>e. exterior usage</li><li>f. other appurtenances</li></ul></li></ul></li><li>(b) Adherence to relevant codes</li><li>(c) Methods of sizing water supply systems:<ul style="list-style-type: none"><li>(i) charts to determine flow to various fixtures</li><li>(ii) probability of use factors for various types of buildings</li><li>(iii) frictional losses in pipe, fittings, valves, etc.</li><li>(iv) pressure and static pressure calculations</li><li>(v) fixture unit method of sizing</li><li>(vi) interpretation of water piping tables for determining pipe sizes</li><li>(vii) other methods</li></ul></li><li>(d) Type, sizes and characteristics of pipe:<ul style="list-style-type: none"><li>(i) brass</li><li>(ii) copper pipe or tube</li><li>(iii) galvanised steel</li><li>(iv) wrought iron</li><li>(v) cast iron</li></ul></li><li>(e) Importance and recognition of identification symbols:<ul style="list-style-type: none"><li>(i) physical markings</li><li>(ii) colour codes</li><li>(iii) wall thickness</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 7: Water Supply Systems

### UNIT 2: Cold Water Supply

OPERATIONS	KNOWLEDGE
1. Installing cold water supply pipes in building (Cont'd)	<div data-bbox="719 419 1425 1764"> <ul style="list-style-type: none"> <li>(f) Method of ascertaining wall thickness by:                             <ul style="list-style-type: none"> <li>(i) caliper method</li> <li>(ii) micrometer</li> </ul> </li> <li>(g) Method and importance of proper storage protection of pipe fittings before installation</li> <li>(h) Importance of providing facilities for completely draining system</li> <li>(i) Methods of hanging and/or supporting:                             <ul style="list-style-type: none"> <li>(i) horizontal water pipes</li> <li>(ii) vertical water pipes</li> </ul> </li> <li>(j) Considerations when hanging or supporting pipe due to:                             <ul style="list-style-type: none"> <li>(i) sagging</li> <li>(ii) size and weight of pipe and contents</li> </ul> </li> <li>(k) Type, purpose and characteristics of valves</li> <li>(l) Location of valves in consideration of relevant codes</li> <li>(m) Procedures for installing:                             <ul style="list-style-type: none"> <li>(i) branches off main pipe</li> <li>(ii) risers</li> <li>(iii) riser valves</li> </ul> </li> <li>(n) Methods of passing pipe through:                             <ul style="list-style-type: none"> <li>(i) walls</li> <li>(ii) floors</li> </ul> </li> <li>(o) Importance of using non-toxic thread compounds</li> <li>(p) Necessity for visual inspection of pipe and fittings prior to installation</li> <li>(q) Conditions requiring the use of booster pump:                             <ul style="list-style-type: none"> <li>(i) height of building</li> <li>(ii) fluctuating pressures</li> </ul> </li> <li>(r) Type, purpose and characteristics of booster pumps and hydro-pneumatic systems</li> <li>(s) Importance of protective devices for booster pump installations</li> </ul> </div>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply System

UNIT 2: Cold Water Supply

OPERATIONS	KNOWLEDGE
1. Installing cold water supply pipes in building (Cont'd)	<ul style="list-style-type: none"><li data-bbox="701 439 1296 532">(t) Methods of maintaining adequate pressure in multi-storey building installations:<ul style="list-style-type: none"><li data-bbox="778 536 1041 564">(i) pneumatic</li><li data-bbox="778 568 1009 596">(ii) gravity</li></ul></li><li data-bbox="701 600 1296 663">(u) Methods of installing branches to fixture locations:<ul style="list-style-type: none"><li data-bbox="778 667 1307 729">(i) interpretation of drawings for exact locations</li><li data-bbox="778 733 1307 816">(ii) interpretation of specifications and roughing-in dimensions from catalogues</li><li data-bbox="778 820 1335 883">(iii) minimum size outlets conforming to relevant codes</li><li data-bbox="778 887 1289 949">(iv) position of fixture group valves</li></ul></li><li data-bbox="701 953 1303 1016">(v) Importance of protecting the water pipes during installation</li><li data-bbox="701 1020 1303 1082">(w) Methods and devices for preventing water hammer</li><li data-bbox="701 1086 1114 1114">(x) Effect of water hammer</li><li data-bbox="701 1118 1254 1181">(y) Procedures for protecting water pipes adjacent to outside walls</li><li data-bbox="701 1185 1296 1247">(z) Methods and devices for preventing back-flow</li><li data-bbox="701 1251 1296 1314">(aa) Procedures for protecting exterior services from frost damage</li><li data-bbox="701 1318 1310 1380">(bb) Methods of preparing the water pipe system for tests</li><li data-bbox="701 1384 1219 1447">(cc) Type, purpose and use of test equipment</li><li data-bbox="701 1451 1219 1514">(dd) Methods of testing water pipe systems</li><li data-bbox="701 1518 1282 1580">(ee) Evaluation of test with reference to relevant codes</li><li data-bbox="701 1584 1247 1647">(ff) Methods of protection and safeguarding completed work</li><li data-bbox="701 1651 1352 1713">(gg) Procedures and importance of isolation of system from other source of supply</li><li data-bbox="701 1717 1296 1780">(hh) Importance of minimizing effects of cutting and notching of structural members</li><li data-bbox="701 1784 1324 1846">(ii) Type, purpose and characteristics of back-flow preventers</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply System

UNIT 2: Cold Water Supply

OPERATIONS	KNOWLEDGE
1. Installing cold water supply pipes in building (Cont'd)	<div data-bbox="711 437 1332 497">(jj) Importance of allowing sufficient clearance from structural members</div> <div data-bbox="711 504 1396 788">                     (kk) Mathematics:                     <div data-bbox="806 532 1396 788">                         (i) linear measurements to determine:                         <div data-bbox="929 598 1348 687">                             a. height and run                              b. fitting dimensions                              c. calculation of offsets                         </div>                         (ii) areas of circles, for the combining of pipes                          (iii) square roots                     </div> </div> <div data-bbox="711 794 1410 1266">                     (ll) Science:                     <div data-bbox="806 822 1410 1266">                         (i) chemical composition of water                          (ii) water purification                          (iii) properties of water at various temperatures                          (iv) expansion and contraction                          (v) physical properties                          (vi) electrolysis                          (vii) galvanic action                          (viii) flow of water in pipes                          (ix) pressures and heads                          (x) water hammer                          (xi) kinetic energy                          (xii) atmospheric pressure and siphonage                     </div> </div>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply System

UNIT 2: Cold Water Supply

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### OPERATIONS

### KNOWLEDGE

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#### 2. Repair and maintenance

- (a) Method of inserting tee fitting in water pipe between two fixed points in:
  - (i) cast iron
  - (ii) steel pipe
  - (iii) brass pipe
  - (iv) copper tube
- (b) Procedure for repair and/or replacement of:
  - (i) valves
  - (ii) piping
- (c) Methods of thawing frozen pipes



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply System

UNIT 3: Hot Water Supply

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing domestic hot water supply pipes in buildings	<ul style="list-style-type: none"><li>(a) Interpretations of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) location of heater and hot water storage tank</li><li>(ii) method of heat generation</li><li>(iii) size of mains, branches, risers and outlets to fixtures</li><li>(iv) method of circulation</li><li>(v) provision for expansion of pipes</li><li>(vi) location of valves</li></ul></li><li>(b) Adherence to relevant codes</li><li>(c) Types, purpose and characteristics of pipe and fittings:<ul style="list-style-type: none"><li>(i) brass</li><li>(ii) copper tube</li><li>(iii) galvanised steel</li><li>(iv) galvanised wrought iron</li></ul></li><li>(d) Procedures for estimating size of storage tank and heating unit based on:<ul style="list-style-type: none"><li>(i) type of building</li><li>(ii) occupancy</li><li>(iii) maximum temperature required</li><li>(iv) recovery capacity of heater</li></ul></li><li>(e) Methods of support for large horizontal storage tanks:<ul style="list-style-type: none"><li>(i) concrete saddles</li><li>(ii) pipe stand</li><li>(iii) other methods</li></ul></li><li>(f) Type, purpose and principles of operation of:<ul style="list-style-type: none"><li>(i) direct heaters</li><li>(ii) indirect heaters</li><li>(iii) instantaneous heaters</li></ul></li><li>(g) Methods of installing:<ul style="list-style-type: none"><li>(i) various types of heaters</li><li>(ii) boiler connections to converters</li><li>(iii) circulating pumps</li></ul></li><li>(h) Procedures for installing manifold connections for hot water storage tanks:<ul style="list-style-type: none"><li>(i) in series</li><li>(ii) in parallel</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 7: Water Supply Systems

### UNIT 3: Hot Water Supply

OPERATIONS	KNOWLEDGE
1. Installing domestic hot water supply pipes in buildings (Cont'd)	<ul style="list-style-type: none"><li>(i) Types, purpose and function of:<ul style="list-style-type: none"><li>(i) main control valves</li><li>(ii) drain valves</li><li>(iii) temperature and pressure relief valves</li><li>(iv) temperature control valves</li><li>(v) hot water thermometers</li><li>(vi) pressure gauges</li></ul></li><li>(j) Methods and importance of installation and location of temperature and pressure relief valves:<ul style="list-style-type: none"><li>(i) tap valve</li><li>(ii) blow-off control</li></ul></li><li>(k) Importance of provision of inspection and maintenance facilities for large hot water storage tanks</li><li>(l) Methods of protecting hot water storage tanks from<ul style="list-style-type: none"><li>(i) syphonage</li><li>(ii) scaling</li><li>(iii) corrosion</li><li>(iv) heat loss</li></ul></li><li>(m) Method of boosting temperature of hot water for dishwashing facilities</li><li>(n) Types, purpose and function of circulating pumps</li><li>(o) Method for preventing reverse flow of water in re-circulating pipes</li><li>(p) Type, purpose and function of tempering valves</li><li>(q) Type, purpose and use of expansion loops or fittings</li><li>(r) Importance of provision for expansion and contraction in pipes due to fluctuating temperature</li><li>(s) Importance of use of correct solder in capillary joints in copper tubes for hot water.</li><li>(t) Method of roughing-in for:<ul style="list-style-type: none"><li>(i) non-circulating system</li><li>(ii) gravity circulation</li><li>(iii) forced circulation</li></ul></li><li>(u) Procedure for locating connection to return riser</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply System

UNIT 3: Hot Water Supply

OPERATIONS	KNOWLEDGE
1. Installing domestic hot water supply in buildings (Cont'd)	<div data-bbox="722 425 1380 1864"> <ul style="list-style-type: none"> <li>(v) Importance of installing valves on risers in accordance with relevant codes</li> <li>(w) Importance of using non-soluble thread compounds on hot water pipe threads</li> <li>(x) Procedures for visual inspection of pipe and fittings prior to installation</li> <li>(y) Type, purpose and characteristics of valves</li> <li>(z) Methods of suspension of horizontal hot water pipes with flexible type hangers</li> <li>(aa) Considerations and location of valves</li> <li>(bb) Importance of sleeves where hot water pipes pass through walls and floors</li> <li>(cc) Procedure for positioning of hot water outlet on plumbing fixtures</li> <li>(dd) Importance of leaving sufficient clearance between hot water pipes and structure</li> <li>(ee) Type, purpose and method of insulating hot water pipes and tanks</li> <li>(ff) Importance of providing protection of the system during installation</li> <li>(gg) Importance of adherence to roughing-in dimensions, for outlets: <ul style="list-style-type: none"> <li>(i) as per specifications</li> <li>(ii) roughing-in catalogues</li> <li>(iii) in relation to cold water outlets</li> </ul> </li> <li>(hh) Methods of preparing hot water pipe system for test</li> <li>(ii) Type, purpose and use of test equipment</li> <li>(jj) Methods of testing the hot water pipe system</li> <li>(kk) Evaluation of test with reference to relevant code</li> <li>(ll) Importance of preventing cross-connections between potable and non-potable hot water pipes</li> </ul> </div>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply System

UNIT 3: Hot Water Supply

OPERATIONS	KNOWLEDGE
1. Installing domestic hot water supply in buildings (Cont'd)	<div data-bbox="691 431 1303 526">(mm) Methods of protecting and safe-guarding the system on completion of roughing-in</div> <div data-bbox="691 526 1359 1532"> <div data-bbox="691 526 967 556">(nn) Mathematics:</div> <div data-bbox="785 556 1303 995"> <div data-bbox="785 556 1233 651">(i) linear measurement to determine length and location</div> <div data-bbox="785 651 1268 745">(ii) calculation of required pipe sizes from sizing tables</div> <div data-bbox="785 745 1282 812">(iii) volume of a cylinder for determining tank size</div> <div data-bbox="785 812 1310 939">(iv) conversion of volume cubic ft. to gallons: a. imperial gallons b. U.S. gallons</div> <div data-bbox="785 939 1296 995">(v) weight of water per cubic foot</div> </div> <div data-bbox="691 995 904 1026">(oo) Science:</div> <div data-bbox="785 1026 1359 1532"> <div data-bbox="785 1026 1093 1056">(i) electrolysis</div> <div data-bbox="785 1056 1142 1086">(ii) galvanic action</div> <div data-bbox="785 1086 1058 1116">(iii) hydrolysis</div> <div data-bbox="785 1116 1296 1147">(iv) expansion and contraction</div> <div data-bbox="785 1147 1170 1177">(v) heat transmission</div> <div data-bbox="785 1177 995 1207">(vi) B.T.U.</div> <div data-bbox="785 1207 1044 1237">(vii) syphonage</div> <div data-bbox="785 1237 1345 1268">(viii) physical properties of water</div> <div data-bbox="785 1268 1310 1298">(ix) pressure measuring devices</div> <div data-bbox="785 1298 1352 1328">(x) temperature measuring devices</div> <div data-bbox="785 1328 1282 1358">(xi) characteristics of fuels</div> <div data-bbox="785 1358 1282 1389">(xii) heat and its measurement</div> <div data-bbox="785 1389 1268 1465">(xiii) effects of pressure and temperature thermal heat lag</div> <div data-bbox="785 1465 1268 1532">(xiv) B.T.U. content of fuels</div> </div> </div>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply System

UNIT 3: Hot Water Supply

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### OPERATIONS

### KNOWLEDGE

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2. Repairing and servicing

- (a) Procedures for elimination of noise in system caused by:
  - (i) partially opened valve
  - (ii) loose washers or worn spindles
  - (iii) improper suspension of pipes
  - (iv) pipes in contact with structure
  - (v) cavitation
  - (vi) excess temperature
- (b) Methods of installing temporary plug-in leak on hot water tank:
  - (i) self-tapping
  - (ii) toggle type
  - (iii) other methods
- (c) Methods of restoring flow of water at outlets



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply Systems

UNIT 4: Rural Water Supply Systems

OPERATIONS	KNOWLEDGE
1. Installing a rural water supply system	<ul style="list-style-type: none"><li>(a) Interpretations of drawings and specifications to determine source of supply:<ul style="list-style-type: none"><li>(i) well</li><li>(ii) stream</li><li>(iii) lake</li></ul></li><li>(b) Importance of adherence to relevant codes in constructing wells</li><li>(c) Types of wells:<ul style="list-style-type: none"><li>(i) dug</li><li>(ii) bored</li><li>(iii) driven</li><li>(iv) drilled</li></ul></li><li>(d) Types, purpose and characteristics of pumps:<ul style="list-style-type: none"><li>(i) centrifugal jet, shallow or deep</li><li>(ii) reciprocal, shallow or deep</li><li>(iii) submersible</li><li>(iv) gear</li><li>(v) hydraulic ram</li><li>(vi) other</li></ul></li><li>(e) Sources and application of power:<ul style="list-style-type: none"><li>(i) manual</li><li>(ii) electricity</li><li>(iii) combustion engine</li><li>(iv) wind</li><li>(v) water</li></ul></li><li>(f) Type and characteristics of storage tanks:<ul style="list-style-type: none"><li>(i) gravity</li><li>(ii) hydro-pneumatic</li></ul></li><li>(g) Consideration in determining type and size of pump and storage tank to be used:<ul style="list-style-type: none"><li>(i) number of users</li><li>(ii) number of outlets</li><li>(iii) type of pump</li><li>(iv) type of well and well draw down</li><li>(v) type of tank</li><li>(vi) other requirements</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 7: Water Supply Systems

### UNIT 4: Rural Water Supply Systems

OPERATIONS	KNOWLEDGE
1. Installing a rural water supply system (Cont'd)	<div data-bbox="711 415 1418 1856"> <p>(h) Factors affecting location of pump:</p> <ul style="list-style-type: none"> <li>(i) type of well</li> <li>(ii) relation to building</li> <li>(iii) lowest expected water level</li> </ul> <p>(i) Considerations in location of storage tanks:</p> <ul style="list-style-type: none"> <li>(i) type of tank</li> <li>(ii) relative distance and elevation between tank and building</li> <li>(iii) accessibility</li> <li>(iv) frost protection</li> <li>(v) suitable foundation</li> </ul> <p>(j) Types, purpose and functions of controlling devices:</p> <ul style="list-style-type: none"> <li>(i) pressure switch</li> <li>(ii) float switch</li> <li>(iii) air volume control: <ul style="list-style-type: none"> <li>a. integral type</li> <li>b. air compressor</li> <li>c. manual type</li> </ul> </li> </ul> <p>(k) Types, purpose and functions of measuring devices:</p> <ul style="list-style-type: none"> <li>(i) pressure gauge</li> <li>(ii) gauge glass</li> <li>(iii) level indicator</li> </ul> <p>(l) Types, purpose and functions of protective devices:</p> <ul style="list-style-type: none"> <li>(i) relief valve</li> <li>(ii) overflow pipe</li> <li>(iii) pulsation chamber</li> <li>(iv) draining plugs</li> <li>(v) sand trap</li> </ul> <p>(m) Type, purpose and function of:</p> <ul style="list-style-type: none"> <li>(i) main control valve</li> <li>(ii) drain cock on storage tank</li> <li>(iii) drain cocks on low points of piping system</li> <li>(iv) foot valve</li> <li>(v) check valves</li> </ul> <p>(n) Factors to be considered in the installation of pump suction line:</p> <ul style="list-style-type: none"> <li>(i) size and length</li> <li>(ii) number of joints</li> <li>(iii) use of thread compounds</li> <li>(iv) grade</li> </ul> </div>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 7: Water Supply Systems

### UNIT 4: Rural Water Supply Systems

OPERATIONS	KNOWLEDGE
1. Installing a rural water supply system (Cont'd)	<div data-bbox="702 425 1369 1814"> <ul style="list-style-type: none"> <li>(o) Importance and use of strainers or filters on suction lines</li> <li>(p) Results of leakage on suction pipe:               <ul style="list-style-type: none"> <li>(i) loss of prime</li> <li>(ii) excess air in storage tank</li> </ul> </li> <li>(q) Procedures for installation of cold and hot water distributing pipes</li> <li>(r) Procedures for placing pump in operation</li> <li>(s) Importance of disconnecting pump from tank during initial operation</li> <li>(t) Procedure for renewing prime on pump</li> <li>(u) Methods of determining the potability of the water supply</li> <li>(v) Importance of periodic tests</li> <li>(w) Importance of maintaining potability of water supply systems:               <ul style="list-style-type: none"> <li>(i) cross connections</li> <li>(ii) back-syphonage</li> <li>(iii) location of well in relation to sources of contamination</li> </ul> </li> <li>(x) Methods of purging the systems</li> <li>(y) Conditions requiring the installation of water treating equipment</li> <li>(z) Method of testing water for hardness</li> <li>(aa) Mathematics:               <ul style="list-style-type: none"> <li>(i) linear measurement to determine distance and depth</li> <li>(ii) calculations to determine lift</li> <li>(iii) calculations to determine static level of water</li> <li>(iv) establishing levels and grades for suction pipe</li> <li>(v) calculations of pressures and head</li> </ul> </li> <li>(bb) Science:               <ul style="list-style-type: none"> <li>(i) ground source of water</li> <li>(ii) properties of water</li> <li>(iii) atmospheric pressure</li> <li>(iv) vacuum</li> <li>(v) syphons</li> <li>(vi) theory of pump</li> <li>(vii) Pascal's Principle</li> </ul> </li> </ul> </div>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 7: Water Supply Systems

### UNIT 4: Rural Water Supply Systems

OPERATIONS	KNOWLEDGE
2. Replacing piston leathers and suction and discharge valves on shallow well pumps	<ul style="list-style-type: none"> <li>(a) Methods of dismantling shallow well pumps</li> <li>(b) Methods of replacement piston leathers and valves</li> <li>(c) Importance of: <ul style="list-style-type: none"> <li>(i) position of piston leathers</li> <li>(ii) proper seating of valves</li> <li>(iii) use of new gaskets on valve chamber heads</li> </ul> </li> </ul>
3. Replacing air in water-logged storage tanks	<ul style="list-style-type: none"> <li>(a) Methods of emptying water-logged tank</li> <li>(b) Importance of: <ul style="list-style-type: none"> <li>(i) admission of air</li> <li>(ii) completely draining tank</li> </ul> </li> <li>(c) Procedures for re-starting cycle of operation</li> </ul>
4. Replacing foot valve on suction line	<ul style="list-style-type: none"> <li>(a) Procedures for removing drop pipe from well</li> <li>(b) Importance of provision of: <ul style="list-style-type: none"> <li>(i) slip joint</li> <li>(ii) proper tools and equipment</li> <li>(iii) safety precautions</li> </ul> </li> <li>(c) Methods of replacing foot valve</li> <li>(d) Identification and removal of causes of foot valve failure</li> <li>(e) Methods for re-priming pump</li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply Systems

UNIT 4: Rural Water Supply Systems

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OPERATIONS	KNOWLEDGE
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5. Repairing the plunger of deep-well pump	<ul style="list-style-type: none"><li>(a) Procedures for removal of drop pipe and pump rod</li><li>(b) Importance of:<ul style="list-style-type: none"><li>(i) head room to facilitate removal of pump rods</li><li>(ii) proper tools and equipment</li><li>(iii) severance of power supply</li></ul></li><li>(c) Methods of replacing well cylinder plunger</li><li>(d) Procedures for replacing pump rods and plunger in well casing</li><li>(e) Identification and removal of causes of plunger failure</li><li>(f) Method of determining length of pump rod in relation to:<ul style="list-style-type: none"><li>(i) well check valve</li><li>(ii) pitman arm</li></ul></li><li>(g) Importance of correct oil level in working head</li><li>(h) Procedure for discharging water to drain until clear</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply Systems

UNIT 5: Fire Line Systems

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing fire protection lines	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) connection to source of supply</li><li>(ii) location of hose stations</li><li>(iii) type and sizes of pipe and fittings</li><li>(iv) size and location of mains and standpipes</li><li>(v) siamese connection</li></ul></li><li>(b) Importance of adherence to relevant codes and underwriters specifications</li><li>(c) Type, purpose and function of check valves on fire line connection</li><li>(d) Importance of direct connection to source of supply</li><li>(e) Hazards of intervening valves in fire line connection</li><li>(f) Type, purpose and function of outside booster connection</li><li>(g) Importance of standard hose threads on all outlets</li><li>(h) Function and purpose of ball drip on siamese connection</li><li>(i) Importance of avoiding use of cast iron fittings on fire protection lines</li><li>(j) Methods of installing fire lines and standpipes</li><li>(k) Procedures for supporting:<ul style="list-style-type: none"><li>(i) horizontal mains</li><li>(ii) vertical standpipes</li></ul></li><li>(l) Location of mains and standpipes in relation to:<ul style="list-style-type: none"><li>(i) building components</li><li>(ii) other trades</li><li>(iii) grades</li></ul></li><li>(m) Importance of location of stand-pipe outlets in relation to:<ul style="list-style-type: none"><li>(i) accessibility</li><li>(ii) height from floor</li><li>(iii) physical characteristics of building</li><li>(iv) length of hose</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply Systems

UNIT 5: Fire Line Systems

OPERATIONS	KNOWLEDGE
1. Installing fire protection lines (Cont'd)	<ul style="list-style-type: none"> <li>(n) Methods of installing hose cabinets and control valves</li> <li>(o) Factors to consider in the selection of hose and nozzles:               <ul style="list-style-type: none"> <li>(i) durability</li> <li>(ii) type of material</li> <li>(iii) maximum length</li> <li>(iv) frictional resistance to flow</li> <li>(v) available water pressure</li> <li>(vi) type of spray</li> </ul> </li> <li>(p) Method of placing hose on:               <ul style="list-style-type: none"> <li>(i) reel</li> <li>(ii) rack</li> </ul> </li> <li>(q) Importance of storing hose in closed cabinet</li> <li>(r) Conditions requiring provisions of a booster pump</li> <li>(s) Methods of connection preventing backflow to domestic system</li> <li>(t) Factors in the selection of hose valves               <ul style="list-style-type: none"> <li>(i) durability</li> <li>(ii) non-leakage</li> <li>(iii) ease of operation</li> <li>(iv) rising spindle</li> </ul> </li> <li>(u) Procedure for testing system:               <ul style="list-style-type: none"> <li>(i) type of test</li> <li>(ii) duration</li> </ul> </li> <li>(v) Type, purpose and use of test equipment</li> <li>(w) Evaluation of test with reference to relevant codes</li> <li>(x) Safeguarding the work after completion</li> <li>(aa) Mathematics:               <ul style="list-style-type: none"> <li>linear measurements to determine length of pipe and fitting measurements</li> </ul> </li> <li>(bb) Science:               <ul style="list-style-type: none"> <li>(i) flow through pipes</li> <li>(ii) water pressures and heads</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 7: Water Supply Systems

### UNIT 5: Fire Line Systems

OPERATIONS	KNOWLEDGE
2. Installing ring mains for exterior fire protection	<div data-bbox="718 419 1425 1788"> <p>(a) Interpretation of drawings and specifications to determine:</p> <ul style="list-style-type: none"> <li>(i) type of systems</li> <li>(ii) source of supply</li> <li>(iii) single - dual</li> <li>(iv) location of main control valves</li> <li>(v) location of check valves</li> <li>(vi) location of hydrants</li> <li>(vii) valves in hydrant branches</li> <li>(viii) valve chambers</li> <li>(ix) storage tank</li> <li>(x) storage reservoir</li> <li>(xi) booster pump location</li> </ul> <p>(b) Adherence to relevant codes and underwriters specifications</p> <p>(c) Type of pipe fitting and jointing</p> <p>(d) Factors to be considered for underground installation:</p> <ul style="list-style-type: none"> <li>(i) frost penetration</li> <li>(ii) topographical conditions</li> <li>(iii) ground stability</li> <li>(iv) support on unstable foundation</li> <li>(v) continuous support</li> <li>(vi) stress</li> </ul> <p>(e) Importance of adherence to relevant codes in excavating and shoring trenches</p> <p>(f) Methods of trench excavation:</p> <ul style="list-style-type: none"> <li>(i) manual</li> <li>(ii) mechanical</li> </ul> <p>(g) Procedures for placing pipe in trenches:</p> <ul style="list-style-type: none"> <li>(i) hand methods</li> <li>(ii) mechanical methods</li> </ul> <p>(h) Methods of installing branches to hydrants</p> <p>(i) Type, purpose and function of thrust blocks at:</p> <ul style="list-style-type: none"> <li>(i) changes in direction</li> <li>(ii) hydrant locations</li> <li>(iii) rapid grade changes</li> </ul> <p>(j) Conditions requiring the use of saddles or anchors</p> </div>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply Systems

UNIT 5: Fire Line Systems

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### OPERATIONS

### KNOWLEDGE

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2. Installing ring mains for exterior fire protection (Cont'd)

- (k) Importance of provisions for:
  - (i) protection of frost heave at hydrants
  - (ii) drainage facilities
  - (iii) frost protection inside hydrant
- (l) Method of removing water from hydrant barrel
- (m) Type, purpose and function of indicator valves
- (n) Importance of protection against backflow into municipal system
- (o) Importance of strategically placing valves in relation to buildings
- (p) Provisions for connections for fire department pumper
- (q) Procedure for testing system
  - (i) type of test
  - (ii) duration
- (r) Type, purpose and use of test equipment
- (s) Evaluation of test with reference to relevant codes
- (t) Importance of safeguarding the system upon completion
- (u) Importance of care in back-filling trenches:
  - (i) stabilization of pipe
  - (ii) quality of material
  - (iii) avoidance of deleterious matter
- (v) Methods of compaction:
  - (i) manual
  - (ii) pneumatic
- (w) Restoration of topography with regard to erosion
- (x) Importance of purging pipes
- (y) Mathematics:
  - (i) linear measurement to determine depth and run
  - (ii) cubic measurement to determine excavation estimates and backfill quantities
  - (iii) calculating depth of excavations using the builders dumpy level



# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 7: Water Supply Systems

UNIT 5: Fire Line Systems

OPERATIONS	KNOWLEDGE
2. Installing ring mains for exterior fire protection (Cont'd)	(z) Science: (i) flow through pipes (ii) pressure and its measurement (iii) weights of soils
3. Detecting leaks on pipe lines	(a) Methods of detecting leakage on buried pipe lines with the use of: (i) earphone diaphragm (ii) geophone instrument (b) Procedure for the use of the valve box locator
4. Repairing leaks on pipe lines	(a) Procedures for tightening caulked joints (b) Methods of repairing mechanical joints (c) Procedures for replacing defective section (d) Methods of installing bell joint clamps
5. Inserting of extra branch	(a) Methods of installation of branch fitting with use of: (i) sleeved flanged connection (ii) insertion of tee fitting
6. Repairing hydrants	(a) Methods of repairing leaks, and/or replacing defective unit (b) Procedures for removing and/or replacing spindle and valve unit (c) Techniques in the use of: (i) hydrant pump (ii) steam nozzle connection



AN ANALYSIS OF THE PLUMBING TRADE

- ROUGHING-IN -

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BLOCK 8: Process Supply Systems

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# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 8: Process Supply Systems

UNIT 1: Special Water Systems

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing chilled water systems	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) source of supply</li><li>(ii) piping system</li><li>(iii) method of circulation</li><li>(iv) number and location of outlets</li><li>(v) type of storage</li><li>(vi) insulation requirements</li><li>(vii) size and type of cooling unit</li></ul></li><li>(b) Type, purpose and characteristics of chilled water systems in:<ul style="list-style-type: none"><li>(i) dairies</li><li>(ii) laboratories</li><li>(iii) hospitals</li><li>(iv) industry</li></ul></li><li>(c) Function, type and characteristics of cooling units</li><li>(d) Type, purpose and function of system components:<ul style="list-style-type: none"><li>(i) compressor valves</li><li>(ii) test manifolds</li><li>(iii) line strainers</li><li>(iv) diaphragm valves</li><li>(v) receiver valves</li><li>(vi) relief valves</li><li>(vii) heat exchanger</li></ul></li><li>(e) Type, characteristics and utilization of pipe and fittings for chilled water systems</li><li>(f) Installation requirements for:<ul style="list-style-type: none"><li>(i) up-feed systems</li><li>(ii) down-feed systems</li></ul></li><li>(g) Importance of adherence to relevant codes and regulations</li><li>(h) Procedures for installing pipes and fittings</li><li>(i) Importance of cleaning interior of pipe and fittings during installation</li><li>(j) Techniques for installing system components</li><li>(k) Type, purpose and method of installing insulation:<ul style="list-style-type: none"><li>(i) cork</li><li>(ii) plastic foam</li><li>(iii) other</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 8: Process Supply Systems

UNIT 1: Special Water Systems

OPERATIONS	KNOWLEDGE
1. Installing chilled water systems (Cont'd)	<div data-bbox="697 425 1355 1314"> <ul style="list-style-type: none"> <li>(l) Procedure for connecting system to available cold water supply</li> <li>(m) Importance of safeguarding system on completion of installation</li> <li>(n) Procedures for testing systems:                             <ul style="list-style-type: none"> <li>(i) type of test</li> <li>(ii) test duration</li> <li>(iii) type and utilization of test equipment</li> <li>(iv) test evaluation</li> </ul> </li> <li>(o) Methods of reclaiming water from:                             <ul style="list-style-type: none"> <li>(i) cooling towers</li> <li>(ii) spray ponds</li> <li>(iii) condenser coils</li> </ul> </li> <li>(p) Importance and methods of identifying chilled water systems:                             <ul style="list-style-type: none"> <li>(i) colour coding pipe</li> <li>(ii) tags</li> <li>(iii) other means of identification</li> </ul> </li> <li>(q) Mathematics:                             <ul style="list-style-type: none"> <li>linear measurement to determine system layout and pipe run</li> </ul> </li> <li>(r) Science:                             <ul style="list-style-type: none"> <li>(i) properties of refrigerants</li> <li>(ii) refrigeration cycle</li> <li>(iii) characteristics of solids, liquids and gases</li> </ul> </li> </ul> </div>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 8: Process Supply Systems

UNIT 1: Special Water Systems

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OPERATIONS	KNOWLEDGE
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2. Installing distilled water systems	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) source of supply</li><li>(ii) piping system</li><li>(iii) pipe and fittings required</li><li>(iv) location of outlets</li><li>(v) distillation unit</li></ul></li><li>(b) Characteristics and application of distilled water systems for:<ul style="list-style-type: none"><li>(i) battery manufacture</li><li>(ii) drinking fountains</li><li>(iii) hospitals</li><li>(iv) drug and beverage manufacturers</li></ul></li><li>(c) Function and characteristics of distillation units</li><li>(d) Type, purpose and use of pipe and fittings used in distilled water systems</li><li>(e) Methods of installing pipe and fittings</li><li>(f) Importance of cleaning interior surfaces of pipe and fittings during installation</li><li>(g) Effect of galvanic corrosion through joining dissimilar metals</li><li>(h) Procedures for installing distillation unit and components</li><li>(i) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine system layout and calculate length and run of pipe</li></ul></li><li>(j) Science:<ul style="list-style-type: none"><li>(i) distillation</li><li>(ii) chemical characteristics of distilled water</li><li>(iii) galvanic corrosion</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 8: Process Supply Systems

UNIT 1: Special Water Systems

OPERATIONS	KNOWLEDGE
3. Installing non-potable water supply systems	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) source of supply</li><li>(ii) location of mains, risers and branches</li><li>(iii) connection to supply</li></ul></li><li>(b) Sources of supply for non-potable water systems:<ul style="list-style-type: none"><li>(i) lakes</li><li>(ii) streams</li><li>(iii) wells</li><li>(iv) other</li></ul></li><li>(c) Considerations and conditions influencing the use of non-potable water systems</li><li>(d) Importance of adherence to relevant codes and regulations</li><li>(e) Importance of isolation of non-potable systems from potable systems</li><li>(f) Type, purposes and use of pipe, fittings, fixtures and appliances used in non-potable water supply systems</li><li>(g) Procedures for installing pipe fittings</li><li>(h) Techniques for installing fixtures and appliances</li><li>(i) Effect of galvanic corrosion through joining dissimilar metals</li><li>(j) Methods of installing back-flow devices where:<ul style="list-style-type: none"><li>(i) air gap is impracticable</li><li>(ii) pressure differentials occur</li></ul></li><li>(k) Importance and method of coding non-potable water distributing pipes</li><li>(l) Mathematics:<ul style="list-style-type: none"><li>linear measurement to calculate length and run of pipe</li></ul></li><li>(m) Science:<ul style="list-style-type: none"><li>(i) Bacteria</li><li>(ii) PH scale</li><li>(iii) water purification</li><li>(iv) water pollution</li><li>(v) galvanic corrosion</li></ul></li></ul>



## BLOCK 8: Process Supply Systems

## UNIT 1: Special Water Systems

OPERATIONS	KNOWLEDGE
4. Installing lawn irrigation systems	<ul style="list-style-type: none"> <li>(a) Interpretation of drawings and specifications to determine:               <ul style="list-style-type: none"> <li>(i) source of supply</li> <li>(ii) type of system</li> <li>(iii) size of pipe and fittings</li> </ul> </li> <li>(b) Interpretation and adherence to relevant codes and regulations</li> <li>(c) Factors to be considered for control and zoning irrigation systems</li> <li>(d) Requirements influencing the selection of spray heads and/or hydraulic oscillators</li> <li>(e) Considerations in locating spray heads to obtain:               <ul style="list-style-type: none"> <li>(i) 360° spray area</li> <li>(ii) 180° spray area</li> </ul> </li> <li>(f) Procedures for sizing distributing pipes and spray heads</li> <li>(g) Methods of trenching for pipe installation:               <ul style="list-style-type: none"> <li>(i) manual</li> <li>(ii) mechanical</li> </ul> </li> <li>(h) Importance of grading trenches to permit self-draining of pipes</li> <li>(i) Type and characteristics of devices for draining pipes:               <ul style="list-style-type: none"> <li>(i) seepage pits</li> <li>(ii) drainage valves</li> <li>(iii) blowing-out lines</li> </ul> </li> <li>(j) Type, size and characteristics of pipe and fittings used in lawn irrigation systems:               <ul style="list-style-type: none"> <li>(i) galvanised steel</li> <li>(ii) copper tube</li> <li>(iii) plastic hose</li> </ul> </li> <li>(k) Methods of installing pipe and fittings</li> <li>(l) Techniques of fabricating plastic hose and fittings</li> <li>(m) Methods of adaption to metallic piping</li> <li>(n) Procedures for installing valves and controls</li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 8: Process Supply Systems

UNIT 1: Special Water Systems

OPERATIONS	KNOWLEDGE
4. Installing lawn irrigation systems (Cont'd)	<ul style="list-style-type: none"><li>(o) Effect and method of preventing back-syphonage into domestic water supply</li><li>(p) Methods for injection of chemical fertilizers into system</li><li>(q) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to determine piping run and layout</li><li>(ii) calculation of volume to estimate quantity of excavated material</li><li>(iii) calculation of area to facilitate location of spray heads</li></ul></li><li>(r) Science:<ul style="list-style-type: none"><li>(i) atmospheric pressure</li><li>(ii) syphonage</li><li>(iii) chemical fertilizers</li><li>(iv) water pressure and pressure due to head</li><li>(v) galvanic corrosion</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

### BLOCK 8: Process Supply System

### UNIT 2: Soap Dispensing Systems

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OPERATIONS	KNOWLEDGE
1. Installing liquid soap dispensing system	<div data-bbox="718 419 1376 1766"><ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) type of system</li><li>(ii) gravity</li><li>(iii) pressure</li><li>(iv) location of tank</li><li>(v) location of outlets</li></ul></li><li>(b) Types and characteristics of fixtures served by liquid soap systems:<ul style="list-style-type: none"><li>(i) public wash basins</li><li>(ii) group washing sinks</li><li>(iii) dispensary fixtures</li><li>(iv) operating room sinks</li></ul></li><li>(c) Type, purpose and use of pipe and fittings:<ul style="list-style-type: none"><li>(i) brass</li><li>(ii) copper tube</li><li>(iii) galvanised steel pipe</li><li>(iv) black steel pipe</li><li>(v) plastic</li><li>(vi) others</li></ul></li><li>(d) Location of soap tanks for:<ul style="list-style-type: none"><li>(i) complete central system</li><li>(ii) group system</li></ul></li><li>(e) Methods of installing pipes and fittings as in Block 2, Unit 3.</li><li>(f) Effect of galvanic corrosion through joining dissimilar metals</li><li>(g) Type, purpose and applications of soap dispensing valves:<ul style="list-style-type: none"><li>(i) straight pattern</li><li>(ii) angle pattern</li></ul></li><li>(h) Procedures for installing dispensing valves</li><li>(i) Considerations in the utilization of soap dispensing systems</li><li>(j) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to determine length and run</li><li>(ii) calculation of volume to determine storage tank capacity</li></ul></li></ul></div>

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# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 8: Process Supply Systems

UNIT 3: Special Fluid Systems

OPERATIONS	KNOWLEDGE
1. Installing special fluid process piping systems	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) characteristics of fluid to be carried</li><li>(ii) pipe system requirements</li><li>(iii) installation requirements</li></ul></li><li>(b) Type, purpose and characteristics of special requirements for fluid transfer in:<ul style="list-style-type: none"><li>(i) bakeries</li><li>(ii) dairies</li><li>(iii) distilleries</li><li>(iv) food processing</li><li>(v) breweries</li><li>(vi) laboratories</li><li>(vii) meat packing plants</li><li>(viii) refineries</li><li>(ix) hospitals</li><li>(x) factories</li><li>(xi) buildings</li></ul></li><li>(c) Type, purpose, characteristics and utilization of pipe, fittings and equipment for special fluid condition</li><li>(d) Procedures for installing pipe and fittings</li><li>(e) Importance of adherence to relevant codes and regulations</li><li>(f) Effect of galvanic corrosion through joining dissimilar metals</li><li>(g) Procedures for installing fixtures appliances and equipment</li><li>(h) Considerations of the effect of fluids and chemicals on system and pipe</li><li>(i) Method and importance of maintaining sanitary condition in pipe system during and after installation</li><li>(j) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurement to calculate length and run of pipe</li><li>(ii) volume to determine fluid capacities</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - ROUGHING-IN -

BLOCK 8: Process Supply System

UNIT 3: Special Fluid System

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OPERATIONS	KNOWLEDGE
1. Installing special fluid process piping systems (Cont'd)	(k) Science: (i) chemical properties and changes (ii) acids bases and salts (iii) hydrolysis (iv) corrosion

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AN ANALYSIS OF THE PLUMBING TRADE  
- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

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BLOCK 9: Basic Fixture and Equipment Fittings

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# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
1. Installing supply fittings	<ul style="list-style-type: none"><li>(a) Interpretation of specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) fixture and roughing-in dimensions</li><li>(ii) type, style and size of supply fittings</li></ul></li><li>(b) Importance of adherence to relevant codes in the selection and installation of supply and combination supply-and-waste fittings</li><li>(c) Types, size and characteristics of fixture and equipment supply fittings:<ul style="list-style-type: none"><li>(i) separate faucets</li><li>(ii) combination supply and mechanical waste</li><li>(iii) combination supply and plug-and-chain</li><li>(iv) combination swing spout</li><li>(v) single lever control</li><li>(vi) sink and shampoo faucets with spray attachments</li><li>(vii) automatic tempering devices</li><li>(viii) other</li></ul></li><li>(d) Familiarity with C.S.A. and manufacturers' standards concerning:<ul style="list-style-type: none"><li>(i) spindle threads</li><li>(ii) spigot threads</li><li>(iii) length of tail-piece</li></ul></li><li>(e) Procedures for installing exposed or concealed faucets:<ul style="list-style-type: none"><li>(i) deck faucets</li><li>(ii) wall mounted</li><li>(iii) fixture mounted</li></ul></li><li>(f) Methods of installing supply and combination supply-and-waste fittings</li><li>(g) Procedures and importance of care when roughing-in fittings for:<ul style="list-style-type: none"><li>(i) clearance from finished wall</li><li>(ii) accessibility of valve bonnets</li><li>(iii) air gap</li><li>(iv) alignment with fixture</li></ul></li><li>(h) Procedures and care to be observed when attaching supply fittings to fixture</li><li>(i) Function and application of crow's foot washer and other locking devices</li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 9: Basic Fittings

UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
1. Installing supply fittings (Cont'd)	(j) Importance of using correct tools and techniques to prevent damage to finished parts (k) Procedures for installing chrome-plated fittings using: (i) friction-type wrenches (ii) smooth jaw wrenches (iii) non-scratch powder (l) Results of installing faucets with: (i) undersize orifices (ii) cone-shaped washers (iii) feather-edged washers (iv) loose spindles and washer retaining screws (m) Importance of maintaining standard relative positions of hot and cold water faucets (n) Considerations in the use of renewable seats in faucets (o) Conditions contributing to and effect of wire drawing on faucet seats (p) Importance of assembly of components in correct sequence (q) Consideration of type of connection of swing spout faucets to facilitate removal and repair (r) Function of integral or exposed stops on water supply fittings (s) Hazards in the use of submerged fittings: (i) back syphonage (ii) back flow (t) Effects of using submerged hose connections (u) Types, function and characteristics of vacuum breakers (v) Methods of installing vacuum breakers (w) Method of calculating dimensions for supply pipes from wall or floor (x) Procedures for installing supply pipes (y) Types, purpose and methods of applying escutcheons

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
1. Installing supply fittings (Cont'd)	<ul style="list-style-type: none"><li>(z) Methods of connecting faucets to supply piping of various materials:<ul style="list-style-type: none"><li>(i) threading</li><li>(ii) soldering</li><li>(iii) compression fitting</li></ul></li><li>(aa) Characteristics and methods of applying thread sealants</li><li>(bb) Results of excessive tightening of coupling and union nuts</li><li>(cc) Considerations in the selection and use of flexible supply pipes</li><li>(dd) Importance and methods of testing installation for:<ul style="list-style-type: none"><li>(i) correct operation</li><li>(ii) adequate water supply</li></ul></li><li>(ee) Importance of removing aerators and/or strainers on faucet spouts while flushing-out</li><li>(ff) Mathematics:<ul style="list-style-type: none"><li>linear measurements to determine:<ul style="list-style-type: none"><li>(i) location of fitting</li><li>(ii) length of supply pipes</li></ul></li></ul></li><li>(gg) Science:<ul style="list-style-type: none"><li>(i) galvanic corrosion</li><li>(ii) physical properties of ferrous and non-ferrous metals</li><li>(iii) flow of liquid through pipes</li><li>(iv) syphonage</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
2. Installing control valves	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) size</li><li>(iii) location</li></ul></li><li>(b) Types, function and characteristics of control valves:<ul style="list-style-type: none"><li>(i) compression</li><li>(ii) needle</li><li>(iii) other</li></ul></li><li>(c) Types of control valve stops:<ul style="list-style-type: none"><li>(i) wheel handle</li><li>(ii) screwdriver</li><li>(iii) lock shield</li><li>(iv) key</li></ul></li><li>(d) Adherence to relevant codes in the selection, location and installation of control valves</li><li>(e) Familiarity with C.S.A. and manufacturers' standards concerning:<ul style="list-style-type: none"><li>(i) spindle threads</li><li>(ii) soldering</li><li>(iii) compression fitting</li></ul></li><li>(f) Considerations in locating and installing control valves:<ul style="list-style-type: none"><li>(i) accessibility for operation<ul style="list-style-type: none"><li>a. access doors or plates</li><li>b. partition stops</li><li>c. exposed</li></ul></li><li>(ii) ease of operation</li><li>(iii) spindle and handle clearance</li><li>(iv) accessibility for repair</li></ul></li><li>(g) Importance of following manufacturers' recommendations in positioning control valves</li><li>(h) Importance of using correct tools and techniques to prevent damage to finished parts</li><li>(i) Procedures for installing chrome-plated fittings using:<ul style="list-style-type: none"><li>(i) friction - type wrenches</li><li>(ii) smooth jaw wrenches</li><li>(iii) non-scratch powder</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
2. Installing control valves (Cont'd)	(j) Results of installing valves with: (i) undersize orifices (ii) cone-shaped washers (iii) loose spindles and washer retaining screws (k) Conditions contributing to and of wire drawing on valve seats (l) Importance of assembly of components in correct sequence (m) Characteristics and methods of applying thread sealants (n) Results of excessive tightening of coupling and union nuts (o) Importance and methods of testing control valve installation for correct operation (p) Mathematics: linear measurements to determine location of control valve (q) Science: (i) galvanic corrosion (ii) physical properties of ferrous and non-ferrous metals (iii) flow of liquid through pipes

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
3. Installing and/or repairing automatic flush valves	<ul style="list-style-type: none"><li>(a) Interpretation of specifications, relevant codes and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) size</li><li>(iii) operating characteristics</li></ul></li><li>(b) Type, purpose and characteristics of automatic flush valves:<ul style="list-style-type: none"><li>(i) diaphragm</li><li>(ii) plunger</li></ul></li><li>(c) Types, function and characteristics of flushing mechanism:<ul style="list-style-type: none"><li>(i) hand-operated lever</li><li>(ii) push button</li><li>(iii) seat-operated</li><li>(iv) foot-operated</li></ul></li><li>(d) Procedures for installing automatic flush valves</li><li>(e) Types, purpose and characteristics of back-syphonage preventers</li><li>(f) Importance of using back syphonage preventers on water closet bowls</li><li>(g) Importance of locating back-syphonage preventers at correct height above bowl</li><li>(h) Result of negative pressure in water supply system</li><li>(i) Conditions &amp; factors that contribute to contamination of water supply</li><li>(j) Considerations in the use of automatic flush valves in domestic plumbing systems:<ul style="list-style-type: none"><li>(i) noise level</li><li>(ii) size of water service</li><li>(iii) available pressure</li><li>(iv) other</li></ul></li><li>(k) Techniques of testing and adjusting automatic flush valve for correct operation</li><li>(l) Diagnosis and recognition of conditions leading toward inefficient automatic flush valve operation</li><li>(m) Procedures for removing and replacing faulty valve diaphragm</li><li>(n) Techniques for clearing clogged valve orifice openings</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
3. Installing and/or repairing automatic flush valves (Cont'd)	<ul style="list-style-type: none"><li>(o) Methods of repairing and replacing valve pistons or plungers</li><li>(p) Procedures for examining and replacing valve washer</li><li>(q) Methods of replacing handle springs and washers</li><li>(r) Importance of shutting off water supply before repairing valve</li><li>(s) Importance of cleaning and flushing out valve body before replacing component parts</li><li>(t) Science:<ul style="list-style-type: none"><li>(i) Pascal's Principle - transmission of pressure in liquids</li><li>(ii) flow through pipes</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
4. Repairing and/or replacing water supply fittings, control valves and supply piping	<ul style="list-style-type: none"><li>(a) Procedures and importance of controlling water supply during repair</li><li>(b) Types, purpose and characteristics of faucet and valve washers</li><li>(c) Procedures for replacement of washers in:<ul style="list-style-type: none"><li>(i) combination deck fitting</li><li>(ii) concealed combination fitting</li><li>(iii) separate faucets</li><li>(iv) spray and shampoo faucets</li><li>(v) automatic temperature controlled faucets</li><li>(vi) self-closing faucets</li></ul></li><li>(d) Importance of use of correct type and quality of washers</li><li>(e) Procedures and care to be observed in removal and replacement of faucet and valve components:<ul style="list-style-type: none"><li>(i) handles</li><li>(ii) escutcheons</li><li>(iii) bonnets</li><li>(iv) renewable seats</li><li>(v) washer and handle retaining screws</li></ul></li><li>(f) Techniques for removal of broken or corroded valve and faucet washer retaining screws</li><li>(g) Techniques and use of devices for regrounding seats</li><li>(h) Conditions contributing to wire drawing on valve and faucet seats</li><li>(i) Types, purpose and characteristics of packings</li><li>(j) Methods of replacing packing in:<ul style="list-style-type: none"><li>(i) valve glands</li><li>(ii) faucet bonnets</li></ul></li><li>(k) Methods of replacing "O" ring type packing</li><li>(l) Procedures for replacing spindle sleeves</li><li>(m) Selection of type of spindle thread according to:<ul style="list-style-type: none"><li>(i) quick-opening features</li><li>(ii) durability</li><li>(iii) interchangeability</li></ul></li><li>(n) Type, purpose and use of lubricants for:<ul style="list-style-type: none"><li>(i) spindle sleeves</li><li>(ii) spindle threads</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
4. Repairing and/or replacing water supply fittings, control valves and supply piping (Cont'd)	<ul style="list-style-type: none"><li>(o) Procedures for removal and replacement of water supply fittings</li><li>(p) Types, purpose and use of basin wrenches</li><li>(q) Methods of removing encrusted, seized or damaged coupling nuts and locknuts</li><li>(r) Techniques for removing broken tail pieces from threaded fittings</li><li>(s) Considerations in the selection of replacement faucets:<ul style="list-style-type: none"><li>(i) type and characteristics of fixture</li><li>(ii) existing center-to-center distance</li><li>(iii) mechanical waste requirements</li></ul></li><li>(t) Application and methods of installing adapter wall plates for new type replacement</li><li>(u) Consideration of need of replacement of crow's foot washer or other locking devices</li><li>(v) Importance of installing replacement parts in correct sequence</li><li>(w) Care to be exercised in preventing:<ul style="list-style-type: none"><li>(i) undue stress on fixtures and supply fittings</li><li>(ii) marring of fixture or fitting surfaces</li></ul></li><li>(x) Importance of correct spindle rotation for shut-off of hot and cold water faucets</li><li>(y) Importance of correctly positioning lever handles following repair</li><li>(z) Procedures for repairing leaks on swing spouts using:<ul style="list-style-type: none"><li>(i) packing nuts</li><li>(ii) ring seals</li><li>(iii) "O" rings</li></ul></li><li>(aa) Types, purpose and characteristics of diverter valves</li><li>(bb) Methods of repairing and adjusting diverter valves</li><li>(cc) Techniques for cleaning and renewing screens and aerator outlets</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 1: Supply Fittings

OPERATIONS	KNOWLEDGE
4. Repairing and/or replacing water supply fittings, control valves and supply piping (Cont'd)	<ul style="list-style-type: none"> <li>(dd) Techniques for adapting piping to dimensions of new type replacement supply fittings</li> <li>(ee) Procedures for removing and replacing supply pipes of: <ul style="list-style-type: none"> <li>(i) copper</li> <li>(ii) steel</li> <li>(iii) lead</li> <li>(iv) chrome-plated brass</li> </ul> </li> <li>(ff) Techniques of prefitting and assembly of supply piping for installation in inaccessible locations</li> <li>(gg) Importance of care and procedures for turning on water supply</li> <li>(hh) Mathematics: <ul style="list-style-type: none"> <li>linear measurements to determine: <ul style="list-style-type: none"> <li>(i) length of tail piece to suit replacement fitting</li> <li>(ii) adjustment of dimensions to suit center-distance of replacement fitting</li> </ul> </li> </ul> </li> <li>(ii) Science: <ul style="list-style-type: none"> <li>(i) physical properties of ferrous and non ferrous metals</li> <li>(ii) galvanic corrosion</li> <li>(iii) types of lubricants and their uses</li> <li>(iv) hydrolysis</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 2: Waste Fittings

OPERATIONS	KNOWLEDGE
1. Installing waste fittings, strainers and plug outlets	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) size</li></ul></li><li>(b) Types, function and characteristics of fixture and equipment waste fittings:<ul style="list-style-type: none"><li>(i) mechanical waste fitting</li><li>(ii) plug outlet type</li><li>(iii) strainers</li></ul></li><li>(c) Types, purpose and characteristics of tail pieces</li><li>(d) Methods of installing waste fittings, P.O. plugs and strainers</li><li>(e) Procedures for connecting tail pieces to strainers</li><li>(f) Importance of installing components in correct sequence</li><li>(g) Effect of misalignment of fitting in waste opening</li><li>(h) Type, purpose and use of sealing compounds</li><li>(i) Importance of use of non-staining sealing compounds</li><li>(j) Effect of rough interior surfaces or improperly formed cross bars on waste operation</li><li>(k) Methods of adjusting mechanical fittings for correct operation to obtain:<ul style="list-style-type: none"><li>(i) tight closure</li><li>(ii) optimum opening</li><li>(iii) maintenance of open position</li></ul></li><li>(l) Techniques for establishing size of plug, determining length of chain and attachment to fixture</li><li>(m) Science:<ul style="list-style-type: none"><li>(i) galvanic corrosion</li><li>(ii) composition and properties of sealing compounds</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 2: Waste Fittings

OPERATIONS	KNOWLEDGE
2. Installing fixture and equipment traps	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications, manufacturers' catalogues and roughed-in dimensions to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) size</li><li>(iii) depth of seal</li></ul></li><li>(b) Methods of obtaining vertical and horizontal distances from P.O. plug or strainer to waste outlet</li><li>(c) Adherence to relevant codes in the selection and installation of fixture and equipment traps</li><li>(d) Types, function and characteristics of fixture and equipment traps:<ul style="list-style-type: none"><li>(i) P trap</li><li>(ii) drum</li><li>(iii) others</li></ul></li><li>(e) Function and characteristics of integral traps</li><li>(f) Considerations in the selection of traps of:<ul style="list-style-type: none"><li>(i) brass</li><li>(ii) copper</li><li>(iii) lead</li><li>(iv) other materials</li></ul></li><li>(g) Methods of connecting traps to fixture or equipment tail pieces</li><li>(h) Procedures for connecting traps to:<ul style="list-style-type: none"><li>(i) threaded waste pipes</li><li>(ii) lead waste pipe</li><li>(iii) copper waste pipes</li><li>(iv) other</li></ul></li><li>(i) Importance of installing traps that have uniform cross-sectional area and are free of interior surface defects</li><li>(j) Considerations in the use of wall outlet traps and adjustable traps</li><li>(k) Effect of union joints on sewer side of trap above water line</li><li>(l) Considerations in the use of immersed slip joints on adjustable traps</li><li>(m) Importance of use of cleanout plug on sink traps</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 2: Waste Fittings

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OPERATIONS	KNOWLEDGE
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2. Installing fixture and equipment traps (Cont'd)	<ul style="list-style-type: none"><li>(n) Methods of measuring trap seals</li><li>(o) Importance of setting trap level with due regard to its seal</li><li>(p) Types, purpose and methods of applying escutcheons at wall and floor</li><li>(q) Importance of using correct tools and techniques to prevent damage to finished parts</li><li>(r) Types, purpose and methods of installing trap standards on slop sinks and laundry tubs</li><li>(s) Techniques for and conditions contributing to roughing-in waste pipe off center</li><li>(t) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine:</li><li>(i) vertical and horizontal distance from P.O. plug to waste outlet</li></ul></li><li>(u) Science:<ul style="list-style-type: none"><li>(i) syphonage</li><li>(ii) galvanic corrosion</li><li>(iii) synthetic rubber (neoprene seal)</li><li>(iv) composition and properties of sealing compounds</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 9: Basic Fittings

UNIT 2: Waste Fittings

OPERATIONS	KNOWLEDGE
3. Clearing stoppages and/or replacing waste pipes and traps	<ul style="list-style-type: none"><li>(a) Methods of determining efficiency of waste pipe and trap:<ul style="list-style-type: none"><li>(i) flush test</li><li>(ii) noise transmission</li></ul></li><li>(b) Identification of causes of stoppage in fixture and equipment waste pipes:<ul style="list-style-type: none"><li>(i) incorrect grade</li><li>(ii) improper installation</li><li>(iii) foreign matter</li><li>(iv) improper venting</li><li>(v) metal fatigue or deterioration of pipe or fittings</li><li>(vi) inefficient operation of mechanical waste fitting</li></ul></li><li>(c) Types, purpose and use of pipe and trap clearing devices and/or compounds</li><li>(d) Methods of clearing stoppages in waste pipes and traps:<ul style="list-style-type: none"><li>(i) flexible cable</li><li>(ii) pressure</li><li>(iii) alkaline solutions</li></ul></li><li>(e) Considerations and importance of care in the use of pipe-clearing compounds</li><li>(f) Techniques for clearing waste pipes through:<ul style="list-style-type: none"><li>(i) waste and/or overflow fittings</li><li>(ii) trap screw</li><li>(iii) cleanout</li><li>(iv) removal of trap</li></ul></li><li>(g) Techniques for directing cable along waste in a continuous waste-and-vent fitting</li><li>(h) Techniques for clearing inaccessible built-in waste and overflow fittings</li><li>(i) Methods of disconnecting and reconnecting adjustable and non-adjustable fixture and equipment traps</li><li>(j) Effect of and method of correcting trap seal loss</li><li>(k) Method of connecting traps to new or old fixture and equipment tail pieces</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 9: Basic Fittings

### UNIT 2: Waste Fittings

OPERATIONS	KNOWLEDGE
3. Clearing stoppages and/or replacing waste pipes and traps (Cont'd)	<ul style="list-style-type: none"> <li>(l) Procedures for disconnecting and reconnecting fixture and equipment waste pipes of: <ul style="list-style-type: none"> <li>(i) lead</li> <li>(ii) copper</li> <li>(iii) iron</li> <li>(iv) other</li> </ul> </li> <li>(m) Techniques for removing and/or replacing fixture and equipment waste pipes: <ul style="list-style-type: none"> <li>(i) under floors</li> <li>(ii) through joists</li> <li>(iii) rerouting to new connection</li> </ul> </li> <li>(n) Methods of reconnecting waste pipe to vent pipe</li> <li>(o) Techniques for removing and/or replacing waste pipe below tiled floors using: <ul style="list-style-type: none"> <li>(i) access pockets</li> <li>(ii) coupled short lengths</li> <li>(iii) wiped flanged joint on lead waste</li> </ul> </li> <li>(p) Methods of using copper couplings as sleeves (unions) when joining copper waste pipe</li> <li>(q) Importance of using correct tools and techniques to prevent damage to finished parts</li> <li>(r) Importance of adherence to relevant codes in the selection and installation of replacement fixture and equipment traps and waste pipes</li> <li>(s) Mathematics: <ul style="list-style-type: none"> <li>linear measurement to determine: <ul style="list-style-type: none"> <li>(i) length of replacement waste pipe</li> <li>(ii) size of replacement trap</li> </ul> </li> </ul> </li> <li>(t) Science: <ul style="list-style-type: none"> <li>(i) syphonage</li> <li>(ii) flow of liquid through pipes</li> <li>(iii) properties of alkaline solutions</li> <li>(iv) galvanic corrosion</li> <li>(v) properties of ferrous and non-ferrous metals</li> <li>(vi) organic solvents</li> <li>(vii) nature and transmission of sound</li> <li>(viii) properties of thermosetting plastics</li> </ul> </li> </ul>

AN ANALYSIS OF THE PLUMBING TRADE  
- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

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BLOCK 10: Fixtures

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# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 1: Bathtubs

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing and setting bathtubs	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) location</li><li>(ii) type</li><li>(iii) roughing-in dimensions</li></ul></li><li>(b) Types, purpose and characteristics of materials of manufacture of bathtubs:<ul style="list-style-type: none"><li>(i) porcelain ware</li><li>(ii) enamelled cast iron</li><li>(iii) enamelled press-formed steel</li></ul></li><li>(c) Type, size and characteristics of bathtubs:<ul style="list-style-type: none"><li>(i) built-in</li><li>(ii) free-standing</li><li>(iii) other</li></ul></li><li>(d) Procedures and care to be observed when handling bathtubs:<ul style="list-style-type: none"><li>(i) unloading and uncrating</li><li>(ii) hoisting</li><li>(iii) moving on floors</li></ul></li><li>(e) Characteristics of wall surfaces for built-in enclosures</li><li>(f) Procedures for the installation of attachments to free-standing tubs for setting and/or locating</li><li>(g) Conditions to be considered when installing bathtubs:<ul style="list-style-type: none"><li>(i) settling</li><li>(ii) structural shrinkage</li></ul></li><li>(h) Methods of setting and levelling fixture</li><li>(i) Importance of bathtub being:<ul style="list-style-type: none"><li>(i) level</li><li>(ii) self-draining</li><li>(iii) in contact with floor at all bearing points</li></ul></li><li>(j) Techniques of protecting bathtub surfaces during construction</li><li>(k) Results of using protective materials containing dyes and/or non-water-based adhesive</li><li>(l) Recognition and methods of repairing damage to bathtub surfaces caused by:<ul style="list-style-type: none"><li>(i) stains</li><li>(ii) chipping</li><li>(iii) scratches</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 1: Bathtubs

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OPERATIONS	KNOWLEDGE
1. Installing and setting bathtubs (Cont'd)	(m) Method of cleaning bathtub surfaces before use (n) Mathematics: linear measurement to calculate roughing-in dimensions (o) Science: (i) identification of stains and their removal (ii) organic solvents

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# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 10: Fixtures

### UNIT 1: Bathtubs

OPERATIONS	KNOWLEDGE
2. Installing waste and overflow fittings	<ul style="list-style-type: none"><li>(a) Interpretation of specifications and manufacturers' catalogues to determine type of waste and overflow fittings:<ul style="list-style-type: none"><li>(i) plug-and-chain</li><li>(ii) mechanical</li></ul></li><li>(b) Methods of achieving adaptability of waste and overflow fittings to contours of bathtubs of different manufacture</li><li>(c) Effect of interior surface roughness on the function of waste and overflow fittings</li><li>(d) Methods of removal of interior surface roughness of fittings</li><li>(e) Procedures for installing fittings</li><li>(f) Effect of misalignment, incorrect size, and/or improper seating of waste and overflow fittings</li><li>(g) Care to be exercised when facing-up overflow fittings and tightening</li><li>(h) Importance of rigid and correct alignment of connections to bath trap</li><li>(i) Methods of connecting to trap inlet of:<ul style="list-style-type: none"><li>(i) lead pipe</li><li>(ii) copper pipe</li><li>(iii) threaded pipe</li></ul></li><li>(j) Procedures for holding components during installation</li><li>(k) Importance of clean surfaces and resilient gasket material</li><li>(l) Selection and use of correct tools during installation</li><li>(m) Procedures for cutting, holding, and threading chrome-plated tubing</li><li>(n) Results of using improper tools on plated and finished surfaces</li><li>(o) Procedures for applying water test</li><li>(p) Hazards created by standing fixture water in overflow fitting when waste outlet is closed</li><li>(q) Care and storage of small tools and accessories</li></ul>



AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 1: Bathtubs

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OPERATIONS

KNOWLEDGE

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2. Installing waste and  
overflow fittings (Cont'd)

- (r) Science:
- (i) flow through pipes
  - (ii) pressure due to head
  - (iii) galvanic corrosion
  - (iv) syphons

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 1: Bathtubs

OPERATIONS	KNOWLEDGE
3. Installing bathtub water supply fittings	<ul style="list-style-type: none"><li>(a) Interpretation of specifications and manufacturers' catalogues to determine type and size of fittings:<ul style="list-style-type: none"><li>(i) concealed</li><li>(ii) exposed</li></ul></li><li>(b) Type, purpose and characteristics of supply fittings and faucets:<ul style="list-style-type: none"><li>(i) combination tub filler and shower fitting</li><li>(ii) overrim tub filler</li><li>(iii) exposed faucets for free-standing tubs</li></ul></li><li>(c) Considerations in the utilization of right or left-hand threaded spindles in certain applications</li><li>(d) Considerations in locating shower riser pipe</li><li>(e) Purpose, dimensions and utilization of air gaps</li><li>(f) Function of integral or exposed stops on tub filler fittings</li><li>(g) Methods of installing faucets</li><li>(h) Techniques for applying escutcheons</li><li>(i) Procedures for installing shower fittings and accessories:<ul style="list-style-type: none"><li>(i) shower heads</li><li>(ii) shower rods</li><li>(iii) shower doors</li><li>(iv) hose attachments</li><li>(v) others</li></ul></li><li>(j) Importance and care to be observed in the storage of parts between roughing-in and finishing periods</li><li>(k) Methods and importance of care when cleaning porcelain, plated and other finished surfaces</li><li>(l) Procedures for testing efficiency of installation before use</li><li>(m) Importance of protecting complete installation:<ul style="list-style-type: none"><li>(i) during work of other trades</li><li>(ii) pending occupancy</li><li>(iii) against freezing</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 1: Bathtubs

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OPERATIONS	KNOWLEDGE
<hr/>	
3. Installing bathtub water supply fittings (Cont'd)	(n) Mathematics: linear measurement to determine: (i) location of fitting (ii) run, diameter and gauge of supply pipes

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 1: Bathtubs

OPERATIONS	KNOWLEDGE
4. Repairing bathtubs	<ul style="list-style-type: none"> <li>(a) Procedures for repairing and/or replacing faucets and faucet components</li> <li>(b) Techniques for repair and/or replacement of supply piping</li> <li>(c) Methods of clearing stoppage in bathtub traps and waste pipes</li> <li>(d) Methods of repairing leaks at: <ul style="list-style-type: none"> <li>(i) "universal" elbow</li> <li>(ii) O.D. outlet tube tee</li> <li>(iii) drain outlet</li> <li>(iv) overflow fitting</li> </ul> </li> <li>(e) Techniques of replacing and adjusting mechanical waste fitting</li> <li>(f) Methods of testing mechanical waste fitting for correct operation</li> <li>(g) Methods of renewing and replacing rubber waste plug and chain</li> <li>(h) Procedures for repairing and/or replacing waste-and-overflow fittings, trap and waste pipe</li> <li>(i) Techniques for ensuring leak-proof seals at: <ul style="list-style-type: none"> <li>(i) bathtub rim</li> <li>(ii) wall outlet supply and fittings</li> </ul> </li> <li>(j) Science: <ul style="list-style-type: none"> <li>(i) synthetic rubber</li> <li>(ii) physical properties of ferrous and non-ferrous metals</li> <li>(iii) galvanic corrosion</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 2: Wash Basins

OPERATIONS	KNOWLEDGE
1. Installing wash basins	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications, and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) location</li><li>(ii) type</li><li>(iii) roughing-in dimensions</li></ul></li><li>(b) Type, purpose and characteristics of wash basins</li><li>(c) Types and characteristics of materials of manufacture of wash basins</li><li>(d) Recognition of desirable characteristics of wash basins:<ul style="list-style-type: none"><li>(i) durability</li><li>(ii) surface smoothness</li><li>(iii) imperviousness to chemical lotions</li><li>(iv) shape retention</li></ul></li><li>(e) Procedures and care to be observed when handling wash basins:<ul style="list-style-type: none"><li>(i) uncrating</li><li>(ii) during installation</li></ul></li><li>(f) Methods of determining measurements of wash basins:<ul style="list-style-type: none"><li>(i) outside dimensions</li><li>(ii) bowl dimensions</li><li>(iii) height of back</li></ul></li><li>(g) Appropriate fixture location from:<ul style="list-style-type: none"><li>(i) finished floor</li><li>(ii) adjacent fixture</li><li>(iii) adjacent walls</li></ul></li><li>(h) Type, purpose, use and characteristics of fasteners used in attaching wash basins to wall and/or floors</li><li>(i) Methods of mounting wash basins:<ul style="list-style-type: none"><li>(i) use of back-up boards</li><li>(ii) direct screwing to studs</li><li>(iii) metal expansion shields (anchors)</li><li>(iv) self supporting</li></ul></li><li>(j) Techniques for installing wash basins:<ul style="list-style-type: none"><li>(i) wall hung</li><li>(ii) combined wall and floor type</li><li>(iii) pedestal</li><li>(iv) slab type (vanity type)</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 10: Fixtures

### UNIT 2: Wash Basins

OPERATIONS	KNOWLEDGE
1. Installing wash basins (Cont'd)	<ul style="list-style-type: none"><li>(k) Techniques of protecting wash basin surfaces during construction</li><li>(l) Type, function and characteristics of overflow channel on wash basins</li><li>(m) Importance of checking overflow channel operation after completion of installation</li><li>(n) Methods and importance of cleaning wash basin surfaces before use</li><li>(o) Type, size and characteristics of wash basin supply fittings:<ul style="list-style-type: none"><li>(i) combination supply and mechanical waste fitting</li><li>(ii) combination supply with plug-and-chain waste fitting</li><li>(iii) separate faucets</li><li>(iv) other</li></ul></li><li>(p) Methods of installing supply and combination supply-and-waste fittings</li><li>(q) Methods of installing control valves</li><li>(r) Techniques for connecting supply piping</li><li>(s) Types, function and characteristics of wash basin waste fittings and traps</li><li>(t) Procedures for installing waste fittings and trap</li><li>(u) Methods of installing escutcheons</li><li>(v) Importance of and procedures for testing complete installation</li><li>(w) Mathematics:<ul style="list-style-type: none"><li>linear measurements to determine:<ul style="list-style-type: none"><li>(i) roughing-in dimensions</li><li>(ii) length of supply and waste piping</li></ul></li></ul></li><li>(x) Science:<ul style="list-style-type: none"><li>(i) identification and removal of stains</li><li>(ii) organic solvents</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 2: Wash Basins

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OPERATIONS	KNOWLEDGE
<hr/> 2. Servicing wash basins	<hr/> (a) Diagnosis and recognition of conditions contributing to inefficient wash basin operation: (i) supply (ii) waste (b) Procedures for repairing and/or replacing supply fittings and components (c) Techniques for clearing stoppages in wash basin traps and waste pipes (d) Methods of repairing or replacing wash basin traps and/or waste pipes

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# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

OPERATIONS	KNOWLEDGE
1. Installing water closet combinations	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) location</li><li>(ii) type</li><li>(iii) roughing-in dimensions</li></ul></li><li>(b) Types and characteristics of water closets:<ul style="list-style-type: none"><li>(i) floor supported</li><li>(ii) wall hung</li><li>(iii) other</li></ul></li><li>(c) Types, function and characteristics of water closet bowls:<ul style="list-style-type: none"><li>(i) syphon jet</li><li>(ii) reverse trap</li><li>(iii) washdown</li><li>(iv) reverse trap without jet</li><li>(v) blowout</li></ul></li><li>(d) Desirable features of water closet bowls</li><li>(e) Procedures for installing water closet combinations</li><li>(f) Adherence to relevant codes concerning water closet selection and installation</li><li>(g) Recognition of prohibited bowl types</li><li>(h) Importance of rigid built-in support for wall-hung closet bowls</li><li>(i) Materials of manufacture of water closet bowls and/or water closet tanks:<ul style="list-style-type: none"><li>(i) vitreous glazed china</li><li>(ii) vitreous glazed earthenware</li><li>(iii) enamelled cast iron</li><li>(iv) other</li></ul></li><li>(j) Techniques for connection of:<ul style="list-style-type: none"><li>(i) spud to closet bowl</li><li>(ii) closet bowl to floor outlet</li><li>(iii) closet bowl to wall outlet</li></ul></li><li>(k) Methods of connecting brass flanges to:<ul style="list-style-type: none"><li>(i) lead waste pipe</li><li>(ii) copper waste pipe</li><li>(iii) other materials</li></ul></li><li>(l) Space requirements around closet bowls for proper ventilation and exposure</li><li>(m) Type, purpose and characteristics of the horn on closet bowl outlet</li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing water closet combinations	<ul style="list-style-type: none"><li>(n) Type, purpose and characteristics of closet bowl gaskets</li><li>(o) Considerations in the use of gasket materials</li><li>(p) Importance of using all bolt holes in closet bowl</li><li>(q) Methods of testing water closet bowls for:<ul style="list-style-type: none"><li>(i) tightness at outlet</li><li>(ii) function and efficiency of trap</li></ul></li><li>(r) Methods of connecting flush tank:<ul style="list-style-type: none"><li>(i) to wall</li><li>(ii) to closet bowl</li><li>(iii) free standing type</li></ul></li><li>(s) Procedures for connection of water supply at floor or wall</li><li>(t) Purpose and use of control valve on supply pipe</li><li>(u) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine:</li><li>(i) roughing-in dimensions</li><li>(ii) length of supply pipe</li></ul></li><li>(v) Science:<ul style="list-style-type: none"><li>(i) syphonage</li><li>(ii) expansion and contraction of metals</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Installing water closet seats	<ul style="list-style-type: none"><li>(a) Types, function and characteristics of water closet seats</li><li>(b) Interpretation of specifications, relevant codes and manufacturers' catalogues to determine type of seat</li><li>(c) Procedures for installing water closet seats</li><li>(d) Importance of minimal contact between seat and bowl</li><li>(e) Results of using unsanitary type seats</li><li>(f) Importance of installing washers and nuts in correct sequence</li><li>(g) Type, purpose and characteristics of pliable washers</li><li>(h) Importance of using pliable washers adjacent to bowl</li><li>(i) Effect of excessive tightening of nuts against bowl</li><li>(j) Importance of adherence to roughing-in measurements to ensure proper seat balance in upright position</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

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### OPERATIONS

### KNOWLEDGE

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3. Testing and adjusting water closet operation

- (a) Type purpose and characteristics of refill devices
- (b) Techniques for testing and adjusting tank float valve to achieve desired storage level
- (c) Desirable characteristics of float valves:
  - (i) tight closure actuated by water level in tank
  - (ii) non-susceptible to back-syphonage
- (d) Types, purpose and characteristics of refill tubes
- (e) Type, function and characteristics of tank flush valves
- (f) Methods of testing and adjusting tank flush valve for correct operation
- (g) Application and use of the control valve
- (h) Method of adjusting tank valve mechanism to ensure:
  - (i) proper flotation of tank ball
  - (ii) positive seating of tank ball
- (i) Importance of height of flush valve seat above rim of bowl in close-coupled closets and one-piece closet connections
- (j) Type, purpose and function of tank lever action
- (k) Considerations in the selection of tank lever action:
  - (i) type of lever action
  - (ii) characteristics of materials
  - (iii) method of manufacture of components
- (l) Methods of adjusting tank lever action for correct flushing operation
- (m) Importance of using control valve on supply pipe:
  - (i) to control noise due to pressure
  - (ii) prior to making repairs or adjustments

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

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OPERATIONS	KNOWLEDGE
3. Testing and adjusting water closet operation (Cont'd)	<ul style="list-style-type: none"><li>(n) Methods of protecting water closet bowls and tanks:<ul style="list-style-type: none"><li>(i) against freezing</li><li>(ii) during periods of building vacancy</li><li>(iii) during further construction</li></ul></li><li>(o) Type, purpose and function of temporary liquid trap seals</li><li>(p) Science:<ul style="list-style-type: none"><li>(i) linkages</li><li>(ii) mechanical advantage</li><li>(iii) levers</li><li>(iv) pistons</li></ul></li></ul>

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## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

OPERATIONS	KNOWLEDGE
4. Repairing and/or replacing tank float valves and refill devices	<ul style="list-style-type: none"> <li>(a) Types, function and characteristics of tank float valves:               <ul style="list-style-type: none"> <li>(i) piston</li> <li>(ii) diaphragm</li> </ul> </li> <li>(b) Procedures for removal and/or replacement of float valves</li> <li>(c) Conditions influencing retention of inlet section through tank</li> <li>(d) Techniques for removal of tank portion of float valve</li> <li>(e) Methods of retaining washers on piston:               <ul style="list-style-type: none"> <li>(i) center-screw</li> <li>(ii) retaining ring</li> <li>(iii) dovetail</li> </ul> </li> <li>(f) Recognition of and procedures for removal and replacement of faulty diaphragm</li> <li>(g) Considerations in the use of nylon seats in float valves</li> <li>(h) Techniques for determining causes of high water:               <ul style="list-style-type: none"> <li>(i) worn washer</li> <li>(ii) leaking float</li> <li>(iii) corroded screws and linkages</li> <li>(iv) faulty riser pipe</li> <li>(v) improper float valve adjustment</li> </ul> </li> <li>(i) Importance of and techniques for adjusting float valve with reference to high water level</li> <li>(j) Techniques for minimizing noise due to pressure using:               <ul style="list-style-type: none"> <li>(i) hooded piston</li> <li>(ii) maximum size water passages</li> <li>(iii) dip (hush) tube</li> <li>(iv) supply valve adjustment</li> </ul> </li> <li>(k) Procedures for adjusting float rod to increase or decrease storage</li> <li>(l) Importance of using optimum length in replacement of float rod</li> <li>(m) Procedures for removal and/or replacement of dip tube or refill tube</li> <li>(n) Techniques for removal of broken stub of refill tube or dip tube</li> </ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

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OPERATIONS	KNOWLEDGE
4. Repairing and/or replacing tank float valves and refill devices (Cont'd)	(o) Importance of correct alignment of refill tube with overflow pipe (p) Identification of causes and corrections for: (i) "chatter" (ii) air discharge through float valve (q) Importance of height of float valve in relation to high water level

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AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

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OPERATIONS	KNOWLEDGE
<hr/>	
5. Repairing and/or replacing tank flush valves	<ul style="list-style-type: none"><li>(a) Types, function and characteristics of tank flush valves</li><li>(b) Recognition of faulty tank flush valve operation</li><li>(c) Procedures for removal and/or replacement of tank flush valves</li><li>(d) Importance and use of spud wrench</li><li>(e) Methods of removing and/or replacing:<ul style="list-style-type: none"><li>(i) rubber float</li><li>(ii) bottom lift wire</li><li>(iii) top lift wire</li><li>(iv) guide arm</li></ul></li><li>(f) Considerations in the replacement of flush valve components:<ul style="list-style-type: none"><li>(i) proper centering of float</li><li>(ii) alignment of lift wires</li><li>(iii) sufficient height of guide arm to permit flotation of float</li><li>(iv) size of float</li></ul></li><li>(g) Procedures for replacing and/or repairing flap type valve</li><li>(h) Methods of removing and/or replacing and positioning overflow tube</li><li>(i) Techniques for removal of broken stub of overflow tube</li><li>(j) Considerations in determining length of replacement overflow tube</li><li>(k) Methods of reassembling guide arm</li><li>(l) Importance of assembling flush valve components in correct sequence</li><li>(m) Considerations in the use of:<ul style="list-style-type: none"><li>(i) cone-shaped gasket inside tank</li><li>(ii) friction washer outside tank</li><li>(iii) friction washers in coupling nuts</li><li>(iv) resiliency retaining packing materials</li></ul></li><li>(n) Techniques for removal of seized coupling nuts and locknuts</li><li>(o) Procedures and care to be observed when removing and/or replacing flush valves in china tanks</li></ul>



AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

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OPERATIONS	KNOWLEDGE
<hr/>	
5. Repairing and/or replacing tank flush valves (Cont'd)	(p) Mathematics: linear measurement to determine length of replacement overflow tube (q) Science: (i) synthetic materials (ii) physical characteristics of ferrous and non-ferrous metals (iii) corrosion

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

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OPERATIONS	KNOWLEDGE
<hr/>	
6. Repairing and/or replacing tank lever action	<ul style="list-style-type: none"><li>(a) Type, purpose and characteristics of tank lever actions</li><li>(b) Procedures for removal and replacement of tank lever action</li><li>(c) Techniques for removing and replacing cams and linkages</li><li>(d) Recognition of causes of faulty tank lever action</li><li>(e) Considerations in the selection of replacement lever actions:<ul style="list-style-type: none"><li>(i) compound lever action</li><li>(ii) forged brass cams</li><li>(iii) locking devices</li><li>(iv) multiple position lift wire</li></ul></li><li>(f) Considerations in the installation of tank lever action:<ul style="list-style-type: none"><li>(i) ease of operation</li><li>(ii) correct balance</li><li>(iii) automatic return to operating position</li></ul></li><li>(g) Mathematics:<ul style="list-style-type: none"><li>linear measurements to determine length of replacement parts</li></ul></li><li>(h) Science:<ul style="list-style-type: none"><li>(i) mechanical advantage of simple levers</li><li>(ii) galvanic corrosion</li><li>(iii) hydrolysis</li><li>(iv) buoyancy</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 10: Fixtures

### UNIT 3: Water Closets

OPERATIONS	KNOWLEDGE
7. Repairing and/or replacing water closet bowls	<ul style="list-style-type: none"><li>(a) Type, function and characteristics of water closet bowls</li><li>(b) Importance of removing water from bowl prior to disconnection</li><li>(c) Considerations in the selection of replacement bowls</li><li>(d) Procedures for removal and/or replacement of water closet bowls</li><li>(e) Procedures and care to be observed in removal and replacement of spuds</li><li>(f) Methods of repairing leakage at spud</li><li>(g) Importance and use of spud wrench and spud holder</li><li>(h) Purpose and use of lugs in closet bowl spuds</li><li>(i) Techniques for installing new spud rubber</li><li>(j) Considerations in the installation of spuds:<ul style="list-style-type: none"><li>(i) clean surfaces</li><li>(ii) use of new resilient rubber washers</li><li>(iii) friction rings</li><li>(iv) forged brass spuds</li><li>(v) accurate machining and threading</li><li>(vi) matching components</li></ul></li><li>(k) Procedures and care to be observed when installing bowl on uneven floor</li><li>(l) Considerations in the replacement of closet bowls:<ul style="list-style-type: none"><li>(i) replacement of gasket of new resilient material</li><li>(ii) replacement of china caps with non-hardening adhesive</li><li>(iii) replacement of seat compatible with bowl</li></ul></li><li>(m) Techniques for replacing flush elbows:<ul style="list-style-type: none"><li>(i) without removing tank from wall</li><li>(ii) without disturbing bowl connection at floor</li></ul></li><li>(n) Effect of excessive protrusion of flush elbow into bowl</li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 3: Water Closets

OPERATIONS	KNOWLEDGE
7. Repairing and/or replacing water closet bowls (Cont'd)	<ul style="list-style-type: none"><li>(o) Methods of clearing clogged jet passages in syphon-jet bowls and clogged flushing rim orifices</li><li>(p) Techniques for removing obstructions from closet bowls without removal from connections</li><li>(q) Techniques for removing stains and deposits from old installations</li><li>(r) Techniques for testing operation of bowl</li><li>(s) Mathematics:<ul style="list-style-type: none"><li>linear measurement to determine roughing-in dimensions for replacement bowl</li></ul></li><li>(t) Science:<ul style="list-style-type: none"><li>(i) stains and their removal</li><li>(ii) synthetic rubbers and their uses</li><li>(iii) ceramics</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 4: Bidets

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing bidets	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications, manufacturers' catalogues and relevant codes to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) roughing-in dimensions</li></ul></li><li>(b) Types, purpose and characteristics of bidets</li><li>(c) Procedures for installing bidets</li><li>(d) Importance of adherence to relevant codes in the selection and installation of bidets and fittings</li><li>(e) Types, purpose and characteristics of traps for bidets</li><li>(f) Procedures for installing waste traps for bidets</li><li>(g) Methods of connecting fixture to trap</li><li>(h) Procedures for connection of water supply pipes to fixture</li><li>(i) Importance of prevention of back-syphonage</li><li>(j) Methods of installing back-flow preventers</li><li>(k) Mathematics:<ul style="list-style-type: none"><li>linear measurements to determine:</li><li>(i) roughing-in dimensions</li><li>(ii) length of supply pipes</li></ul></li><li>(l) Science:<ul style="list-style-type: none"><li>(i) syphonage</li></ul></li></ul>



AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 4: Bidets

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Repairing and servicing bidets	<ul style="list-style-type: none"><li>(a) Diagnosis and recognition of conditions contributing to inefficient bidet operation</li><li>(b) Procedures for installing new washers on control valves</li><li>(c) Techniques for readjustment of valves</li><li>(d) Procedures for clearing stoppages from:<ul style="list-style-type: none"><li>(i) fixture</li><li>(ii) fixture trap</li><li>(iii) waste pipe</li></ul></li><li>(e) Methods of servicing, repairing or replacing back-flow preventers</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 10: Fixtures

### UNIT 5: Showers

OPERATIONS	KNOWLEDGE
1. Installing shower compartments and drains	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) roughing-in dimensions</li></ul></li><li>(b) Importance of adherence to relevant codes in selecting and installing shower compartments</li><li>(c) Types, function and characteristics of shower compartments:<ul style="list-style-type: none"><li>(i) built-up type</li><li>(ii) prefabricated cabinet</li><li>(iii) multiple</li></ul></li><li>(d) Importance of using non-corrosive and impervious surfaces for walls and floors</li><li>(e) Techniques for assembling and installing prefabricated shower compartments</li><li>(f) Conditions requiring installation of copper or lead pans in built-up compartments</li><li>(g) Types, purpose and characteristics of shower compartment pans</li><li>(h) Characteristics and application of base material for shower pans:<ul style="list-style-type: none"><li>(i) dry sand</li><li>(ii) tar paper or tar felt</li><li>(iii) asphaltum coating</li></ul></li><li>(i) Methods of forming and installing lead or copper pans for built-up compartments</li><li>(j) Importance of using correct type, weight and gauge of materials for safes or pans</li><li>(k) Purpose and method of providing weep holes for under-drainage</li><li>(l) Importance and procedures for protection of shower pans from construction damage</li><li>(m) Importance of installation of curb of correct height on shower stalls</li><li>(n) Types, purpose and characteristics of shower drains and strainers</li><li>(o) Importance of adherence to relevant codes in selecting and installing shower drains and strainers</li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 5: Showers

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing shower compartments and drains (Cont'd)	<ul style="list-style-type: none"><li>(p) Method of attaching strainer to waste pipe of:<ul style="list-style-type: none"><li>(i) lead</li><li>(ii) copper</li><li>(iii) steel</li></ul></li><li>(q) Considerations in the use of adjustable type shower drain</li><li>(r) Importance of shaping floor:<ul style="list-style-type: none"><li>(i) grades to drain</li><li>(ii) entirely self-draining</li></ul></li><li>(s) Considerations in determining size and location of shower traps:<ul style="list-style-type: none"><li>(i) type of shower</li><li>(ii) relevant codes</li><li>(iii) roughing-in dimensions</li></ul></li><li>(t) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurements to determine:<ul style="list-style-type: none"><li>a. roughing-in dimensions</li><li>b. length of waste pipes</li></ul></li><li>(ii) linear measurement and geometry to determine pattern layout and development for pans</li></ul></li><li>(u) Science:<ul style="list-style-type: none"><li>(i) physical characteristics of non-ferrous metals</li><li>(ii) corrosion</li><li>(iii) electrolysis - action of uncured cement on lead and copper.</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 5: Showers

OPERATIONS	KNOWLEDGE
2. Installing supply pipes and fittings for showers	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) roughing-in dimensions</li></ul></li><li>(b) Importance of adherence to relevant codes in the selection and installation of supply pipes and fittings</li><li>(c) Types, function and characteristics of shower installations:<ul style="list-style-type: none"><li>(i) single</li><li>(ii) multiple</li></ul></li><li>(d) Type, purpose and characteristics of supply fittings:<ul style="list-style-type: none"><li>(i) combination</li><li>(ii) single control</li><li>(iii) remote control</li></ul></li><li>(e) Methods of installing supply fittings for exposed or concealed installations</li><li>(f) Importance of adequate mixing chamber</li><li>(g) Types, function and characteristics of automatic tempering devices</li><li>(h) Considerations in establishing height of shower head and control valves for:<ul style="list-style-type: none"><li>(i) body shower</li><li>(ii) head shower</li><li>(iii) therapeutical uses</li></ul></li><li>(i) Purpose and method of installing test spouts</li><li>(j) Method of determining size of supply pipes for:<ul style="list-style-type: none"><li>(i) single shower head</li><li>(ii) multiple-head installation</li></ul></li><li>(k) Types, function and characteristics of spray heads:<ul style="list-style-type: none"><li>(i) single</li><li>(ii) multiple</li></ul></li><li>(l) Considerations in the use of the adjustable head</li><li>(m) Effects of hard water on spray head orifices</li><li>(n) Considerations in the use of non-metallic face plate on shower heads</li><li>(o) Function of the ball joint on shower heads</li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 5: Showers

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Installing supply pipes and fittings for showers (Cont'd)	(p) Purpose and methods of installing retaining curtains or screens in shower stalls (q) Mathematics: linear measurement to determine: (i) roughing-in dimensions (ii) length of supply pipes (r) Science: (i) water temperature indicators and control devices (ii) hard and soft water



AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 5: Showers

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OPERATIONS	KNOWLEDGE
<hr/>	
3. Repairing and servicing showers	<ul style="list-style-type: none"><li>(a) Diagnosis and recognition of conditions contributing to inefficient shower operation</li><li>(b) Procedures for replacing washers on shower valves:<ul style="list-style-type: none"><li>(i) exposed fittings</li><li>(ii) concealed fittings</li></ul></li><li>(c) Techniques of adjusting automatic tempering valves</li><li>(d) Methods of removing and replacing washers and/or tempering devices in automatic shower mixing valves</li><li>(e) Methods of cleaning shower heads:<ul style="list-style-type: none"><li>(i) non-removable face plate</li><li>(ii) removable face plate</li><li>(iii) adjustable nozzles</li></ul></li><li>(f) Procedures for clearing shower traps and waste lines:<ul style="list-style-type: none"><li>(i) flexible cable</li><li>(ii) pressure</li><li>(iii) caustic pipe cleaning solutions</li></ul></li><li>(g) Techniques of repairing leaks in shower enclosures</li><li>(h) Procedures for installing new metal pan in shower stalls</li><li>(i) Science:<ul style="list-style-type: none"><li>(i) properties of alkaline solutions</li><li>(ii) galvanic corrosion</li><li>(iii) flow through pipes</li></ul></li></ul>

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 6: Sinks

OPERATIONS	KNOWLEDGE
1. Installing sinks	<ul style="list-style-type: none"> <li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:               <ul style="list-style-type: none"> <li>(i) type</li> <li>(ii) size</li> <li>(iii) roughing-in dimensions</li> </ul> </li> <li>(b) Importance of adherence to relevant codes in the selection and installation of sinks and fittings</li> <li>(c) Types, purpose and characteristics of sinks:               <ul style="list-style-type: none"> <li>(i) single compartment</li> <li>(ii) multiple</li> <li>(iii) combined sink and drainboard</li> </ul> </li> <li>(d) Methods of installing sinks:               <ul style="list-style-type: none"> <li>(i) counter top</li> <li>(ii) wall hung</li> <li>(iii) free-standing</li> <li>(iv) cabinet type</li> </ul> </li> <li>(e) Effect of repeated exposure to acids and abrasive cleaners on sink surfaces</li> <li>(f) Factors affecting choice of materials or applied finishes for various types of fixtures:               <ul style="list-style-type: none"> <li>(i) porcelain</li> <li>(ii) stainless steel</li> <li>(iii) other materials</li> <li>(iv) applied finishes</li> </ul> </li> <li>(g) Factors affecting height of sink rim above floor</li> <li>(h) Types, characteristics and methods of installing sink tail-pieces, strainers and traps</li> <li>(i) Types and characteristics of sink faucets:               <ul style="list-style-type: none"> <li>(i) single loose flange</li> <li>(ii) combination</li> <li>(iii) single-handle control</li> <li>(iv) pre-set temperature control</li> </ul> </li> <li>(j) Procedures for installing sinks water supply fittings:               <ul style="list-style-type: none"> <li>(i) faucets</li> <li>(ii) spray hose</li> <li>(iii) aerator</li> <li>(iv) control valves</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 6: Sinks

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing sinks (Cont'd)	(k) Methods of connecting water supply (l) Methods of applying escutcheons (m) Techniques of testing and cleaning complete installation (n) Mathematics: linear measurement to determine: (i) location and height of fixture (ii) length of supply and waste pipes (o) Science: (i) identification and removal of stains (ii) acids and cleaning agents (iii) soaps and detergents

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 6: Sinks

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Servicing sinks	(a) Diagnosis and recognition of conditions contributing to inefficient sink operation (b) Procedures for repairing and/or replacing sink supply fittings and components and supply piping (c) Techniques for clearing stoppages in sink traps and waste pipes (d) Methods of repairing and/or replacing sink strainers, traps or waste pipes

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 7: Laundry Tubs

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing laundry tubs	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) location</li><li>(ii) type</li><li>(iii) roughing-in dimensions</li></ul></li><li>(b) Types, function and characteristics of laundry tubs:<ul style="list-style-type: none"><li>(i) single outlet</li><li>(ii) two compartment</li><li>(iii) three compartment</li></ul></li><li>(c) Materials of manufacture of laundry tubs</li><li>(d) Procedures and importance of care in handling and uncrating fixture</li><li>(e) Types and characteristics of laundry tub legs and stands</li><li>(f) Methods of erecting legs or stands</li><li>(g) Procedures for securing fixture to supports</li><li>(h) Importance of rigidity of fixture on supports</li><li>(i) Methods of installing built-in laundry tubs in counter tops</li><li>(j) Methods of installing laundry tub strainers in metal tubs</li><li>(k) Procedures for installing laundry tub traps and waste pipes</li><li>(l) Methods of connecting vent pipe for laundry tub trap</li><li>(m) Considerations in the use of a continuous waste and vent connection</li><li>(n) Importance of installation of horizontal vent pipes above fixture</li><li>(o) Importance and procedures for adequately supporting non-rigid waste and vent pipes</li><li>(p) Procedures for extending water supply piping to fixture location</li><li>(q) Importance of installation of supply pipes with standard center-to-center spacing</li><li>(r) Types, function &amp; characteristics of supply pipe fasteners and hangers</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 7: Laundry Tubs

OPERATIONS	KNOWLEDGE
1. Installing laundry tubs (Cont'd)	<ul style="list-style-type: none"> <li>(s) Methods of securing supply piping to walls</li> <li>(t) Considerations and methods of installing insulation on supply piping</li> <li>(u) Importance of use of insulation membrane between ferrous and non-ferrous metals</li> <li>(v) Types, characteristics and methods of installing laundry tub supply fittings:               <ul style="list-style-type: none"> <li>(i) individual</li> <li>(ii) combination</li> </ul> </li> <li>(w) Considerations in installing swing spout faucets:               <ul style="list-style-type: none"> <li>(i) standard relative position of hot and cold water supply pipes</li> <li>(ii) correct operating position of side lever handles</li> </ul> </li> <li>(x) Importance of adherence to relevant codes in the selection and installation of laundry tubs and supply and waste fittings</li> <li>(y) Mathematics:               <ul style="list-style-type: none"> <li>linear measurement to determine:                   <ul style="list-style-type: none"> <li>(i) location of fixture</li> <li>(ii) length and location of supply and waste piping</li> </ul> </li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 8: Urinals

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### OPERATIONS

### KNOWLEDGE

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#### 1. Installing urinals

- (a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:
  - (i) type and size
  - (ii) location
  - (iii) roughing-in dimensions
- (b) Types, function and characteristics of urinals:
  - (i) wall hung
  - (ii) stall
  - (iii) pedestal
  - (iv) trough
- (c) Importance of adherence to relevant codes in the selection and installation of urinals
- (d) Considerations in the use of urinals with integral traps
- (e) Effects of using the trough urinal
- (f) Methods of installing urinals
- (g) Techniques for installing urinal strainers
- (h) Procedures for connecting urinals to outlets:
  - (i) wall outlet
    - a. exposed trap
    - b. integral trap
  - (ii) floor outlet
- (i) Procedures for connecting to waste pipe of:
  - (i) lead
  - (ii) copper
  - (iii) steel
- (j) Types, function and methods of installing urinal flushing devices:
  - (i) syphon storage tanks
  - (ii) flush valves
  - (iii) self closing stops with oscillating handle
- (k) Procedures for installing flush pipe assembly for concealed or exposed flush pipe and tank
- (l) Procedures for testing and adjusting:
  - (i) automatic syphon tank
  - (ii) flush pipes (for even distribution)
  - (iii) hand operated flush valve
- (m) Importance of locating urinals downstream from water closets

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 8: Urinals

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing urinals (Cont'd)	(n) Importance of adequate cleanout provision for urinal traps and waste pipes
	(o) Mathematics: linear measurement to determine:
	(i) fixture location and height
	(ii) fixture spacing for battery installations
	(iii) length of flush pipes

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 8: Urinals

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Maintaining urinals	<ul style="list-style-type: none"><li>(a) Importance of maintaining adequate supply of water to:<ul style="list-style-type: none"><li>(i) prevent lime deposit in traps</li><li>(ii) maintain clear waste pipes</li></ul></li><li>(b) Procedures for adjusting and/or repairing:<ul style="list-style-type: none"><li>(i) hand operated flush valve</li><li>(ii) automatic syphon tank</li></ul></li><li>(c) Methods of clearing stoppages in urinal traps and waste pipes:<ul style="list-style-type: none"><li>(i) flexible cable</li><li>(ii) pressure</li><li>(iii) alkaline solutions</li></ul></li><li>(d) Science:<ul style="list-style-type: none"><li>(i) encrustation</li><li>(ii) lime deposit</li><li>(iii) syphonage</li><li>(iv) corrosion</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

### BLOCK 10: Fixtures

### UNIT 9: Drinking Fountains

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing drinking fountains	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) type and size</li><li>(ii) location</li><li>(iii) roughing-in dimensions</li></ul></li><li>(b) Adherence to relevant codes in the selection and installation of drinking fountains</li><li>(c) Types, function and characteristics of drinking fountains:<ul style="list-style-type: none"><li>(i) wall hung</li><li>(ii) built-in recess</li><li>(iii) pedestal</li><li>(iv) basin attachment</li><li>(v) electrically cooled</li><li>(vi) other</li></ul></li><li>(d) Procedures for mounting and fastening wall hung, built-in and pedestal drinking fountains</li><li>(e) Methods of installing basin attachment fountains</li><li>(f) Procedures for connecting to waste pipes:<ul style="list-style-type: none"><li>(i) integral trap</li><li>(ii) exposed trap</li></ul></li><li>(g) Techniques for connection to waste pipes of:<ul style="list-style-type: none"><li>(i) lead</li><li>(ii) copper</li><li>(iii) steel</li></ul></li><li>(h) Conditions permitting and methods of connecting drinking fountains to:<ul style="list-style-type: none"><li>(i) indirect waste pipe</li><li>(ii) storm drain</li></ul></li><li>(i) Procedures for connecting concealed or exposed fittings to supply piping:<ul style="list-style-type: none"><li>(i) copper tubing</li><li>(ii) threaded pipe</li></ul></li><li>(j) Importance of proper alignment of piping to avoid strain on valves or fixture</li><li>(k) Methods of connecting multiple type fountains</li><li>(l) Methods of providing even flow of water during pressure fluctuations</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 9: Drinking Fountains

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OPERATIONS	KNOWLEDGE
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1. Installing drinking fountains (Cont'd)	(m) Factors governing the supply of distilled water to drinking fountains (n) Procedures for testing installation and adjusting flow control valves (o) Mathematics: linear measurement to determine: (i) location (ii) height of wall hung fixture (iii) length of supply and waste pipes (p) Science: bacteria (transmission of communicable diseases)

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 10: Fixtures

UNIT 9: Drinking Fountains

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OPERATIONS	KNOWLEDGE
2. Maintaining drinking fountains	(a) Procedures for replacing washers and/or springs in control valves (b) Methods of readjusting flow control valves (c) Procedures for cleaning nozzles (d) Methods of clearing and restoring efficiency of waste pipe

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AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

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BLOCK II: Water Conditioning Equipment

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AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 11: Water Conditioning Equipment      UNIT 4: Water Conditioners  
(Softeners)

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing water conditioning equipment (softeners)	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues and manuals to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) capacity</li><li>(iii) location</li><li>(iv) installation procedure</li><li>(v) regenerating procedure</li></ul></li><li>(b) Types, function and characteristics of water conditioning equipment</li><li>(c) Considerations in determining capacity of water softener:<ul style="list-style-type: none"><li>(i) water hardness</li><li>(ii) volume of water required</li><li>(iii) periods between regeneration</li></ul></li><li>(d) Function and mineral removal characteristics of water conditioning agents (components):<ul style="list-style-type: none"><li>(i) zeolite</li><li>(ii) lime-soda</li><li>(iii) permutit</li><li>(iv) other</li></ul></li><li>(e) Methods of installing and levelling water conditioning units</li><li>(f) Procedures for connecting conditioning unit to water supply line</li><li>(g) Consideration of fixtures to be serviced when locating water conditioner in supply line</li><li>(h) Function and characteristics of the bypass:<ul style="list-style-type: none"><li>(i) internal</li><li>(ii) on supply line</li></ul></li><li>(i) Methods of installing bypass loop and valves on supply line:<ul style="list-style-type: none"><li>(i) manually operated</li><li>(ii) automatic</li></ul></li><li>(j) Function and characteristics of the alarm meter</li><li>(k) Procedures for installation of water conditioning components:<ul style="list-style-type: none"><li>(i) coarse gravel</li><li>(ii) fine gravel</li><li>(iii) conditioning agent</li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 11: Water Conditioning Equipment UNIT 4: Water Conditioners  
(Softeners)

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing water conditioning equipment (softeners) (Cont'd)	<ul style="list-style-type: none"><li>(l) Methods of regenerating water softeners:<ul style="list-style-type: none"><li>(i) direct salting</li><li>(ii) brine tank system</li></ul></li><li>(m) Types, purpose and characteristics of brine tanks</li><li>(n) Considerations in locating brine tanks</li><li>(o) Method of connecting brine syphon to backwash line</li><li>(p) Procedure for placing regenerating components in brine tanks:<ul style="list-style-type: none"><li>(i) gravel</li><li>(ii) salt</li><li>(iii) water</li></ul></li><li>(q) Importance of placing components in correct sequence</li><li>(r) Importance and methods of protecting metal brine tank from brine solution</li><li>(s) Importance of covering brine tank</li><li>(t) Methods of determining degree of water hardness:<ul style="list-style-type: none"><li>(i) soap solution</li><li>(ii) laboratory tests</li></ul></li><li>(u) Mathematics:<ul style="list-style-type: none"><li>(i) linear measurements to determine location of unit and length of supply pipes</li><li>(ii) formula to determine capacity of reconditioning equipment</li></ul></li><li>(v) Science:<ul style="list-style-type: none"><li>(i) P.H. scale</li><li>(ii) purification of water</li><li>(iii) properties and characteristics of hard and soft water</li><li>(iv) salt solutions</li></ul></li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 11: Water Conditioning Equipment    UNIT 5: Filters and Chlorinators

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing filters in private water systems	<ul style="list-style-type: none"><li>(a) Interpretation of water tests, manufacturers' manuals, drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) capacity</li><li>(iii) location</li></ul></li><li>(b) Types, function and characteristics of filters:<ul style="list-style-type: none"><li>(i) sand</li><li>(ii) anthrafilt</li><li>(iii) activated carbon</li></ul></li><li>(c) Principles of filtration</li><li>(d) Results of installation of undersize filter</li><li>(e) Importance of rating supply system pressure pump with back-wash rate of filter in gallons per minute</li><li>(f) Methods of installing and levelling filters</li><li>(g) Procedures for connecting supply piping and valves for filter</li><li>(h) Techniques for discharge of back-wash material to suitable outlet or drain</li><li>(i) Methods of placing filter elements</li><li>(j) Importance of ample "free board" above filter elements for efficient back-washing</li><li>(k) Purpose of distribution plate below filter elements</li><li>(l) Methods of preventing channelling in filter bed</li><li>(m) Recognition of conditions contributing to need of replacement of filter elements</li><li>(n) Mathematics:<ul style="list-style-type: none"><li>linear measurements to determine:<ul style="list-style-type: none"><li>(i) location of unit</li><li>(ii) length of supply piping</li></ul></li></ul></li></ul>

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 11: Water Conditioning Equipment UNIT 5: Filters and Chlorinators

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing filters in private water systems (Cont'd)	(o) Science: (i) filtration (ii) characteristics of sedimentary materials a. iron b. clay c. silt d. chlorine e. decayed vegetation f. discoloration (iii) precipitation and suspension of solids in liquids

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 11: Water Conditioning Equipment      UNIT 5: Filters and Chlorinators

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OPERATIONS	KNOWLEDGE
2. Installing chlorinators in private water systems	<ul style="list-style-type: none"><li>(a) Interpretation of water tests, manufacturers' manuals, drawings and specifications to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) capacity</li><li>(iii) location</li></ul></li><li>(b) Principles of chlorination</li><li>(c) Types, function and characteristics of chlorinators:<ul style="list-style-type: none"><li>(i) individual unit</li><li>(ii) combined filter-chlorinator</li></ul></li><li>(d) Importance of using non-metallic pump head, tubing and fittings</li><li>(e) Methods of installing chlorinators:<ul style="list-style-type: none"><li>(i) piping system</li><li>(ii) tank type</li></ul></li><li>(f) Procedures for connecting to supply system</li><li>(g) Techniques for installing chlorinating solution</li><li>(h) Considerations in adjusting feed rate in gallons per hour:<ul style="list-style-type: none"><li>(i) size and requirements of system</li><li>(ii) pressure in system</li><li>(iii) degree of contamination</li></ul></li><li>(i) Techniques for removing chlorine taste and smell from water</li><li>(j) Importance of maintaining correct feed rate</li><li>(k) Sources of contaminated water supply:<ul style="list-style-type: none"><li>(i) wells</li><li>(ii) surface water</li></ul></li><li>(l) Conditions created by the presence in the water supply of:<ul style="list-style-type: none"><li>(i) hydrogen sulphide</li><li>(ii) iron sulphide</li><li>(iii) iron</li></ul></li><li>(m) Techniques for eliminating sulphur and iron from water</li><li>(n) Methods of removing resultant residue</li><li>(o) Importance of frequent back-washing of filtering equipment</li></ul>

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AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 11: Water Conditioning Equipment UNIT 5: Filters and Chlorinators

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OPERATIONS	KNOWLEDGE
<hr/>	
2. Installing chlorinators in private water systems (Cont'd)	(p) Mathematics: linear measurements to determine: (i) location (ii) length of supply piping (q) Science: (i) bacteria in water (ii) contamination of water (iii) characteristics of: a. sodium hypochloride b. hydrogen sulphide c. iron sulphide d. iron oxide e. iron algae and bacteria (iv) flocculation

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

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BLOCK 12: Equipment and Appliances

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# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 1: Dishwashers and Laundry  
Washing Machines

OPERATIONS	KNOWLEDGE
1. Installing dishwashers and laundry washing machines	<p>(a) Interpretation of drawings, specifications and manufacturers' catalogues and manuals to determine:</p> <ul style="list-style-type: none"> <li>(i) location</li> <li>(ii) type</li> <li>(iii) installation procedure</li> </ul> <p>(b) Importance of adherence to relevant plumbing and electrical codes in selecting and installing dishwashers and laundry washing machines</p> <p>(c) Types, function and characteristics of domestic, commercial and institutional dishwashers:</p> <ul style="list-style-type: none"> <li>(i) electrically activated</li> <li>(ii) hydraulically activated</li> </ul> <p>(d) Types, function and characteristics of laundry washing machines:</p> <ul style="list-style-type: none"> <li>(i) gyrator</li> <li>(ii) drum</li> </ul> <p>(e) Importance of adequate floor base and use of vibration shock absorbers</p> <p>(f) Importance of correctly levelling equipment</p> <p>(g) Methods of installing and connecting waste pipe:</p> <ul style="list-style-type: none"> <li>(i) as a separate fixture unit</li> <li>(ii) to waste pipe of another fixture</li> </ul> <p>(h) Procedures for installing trap in waste pipe of separate fixture unit</p> <p>(i) Importance of connecting waste pipe upstream of trap of adjacent fixture</p> <p>(j) Methods and importance of securing long waste pipes in permanent position</p> <p>(k) Importance of and methods of installing control valves in supply lines</p> <p>(l) Procedures for installing and clamping flexible hot and cold water hoses</p> <p>(m) Methods of installing combination washing machine fitting on supply lines</p>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12 : Equipment and Appliances

UNIT 1: Dishwashers and Laundry  
Washing Machines

OPERATIONS	KNOWLEDGE
1. Installing dishwashers and laundry washing machines (Cont'd)	<ul style="list-style-type: none"> <li>(n) Procedures for installing supply and waste for portable electric or self powered washing machines</li> <li>(o) Importance and methods of testing installation for: <ul style="list-style-type: none"> <li>(i) adequacy of hot water supply and storage</li> <li>(ii) efficiency of waste</li> </ul> </li> <li>(p) Mathematics: <ul style="list-style-type: none"> <li>linear measurement to determine location and length of supply and waste piping</li> </ul> </li> <li>(q) Science: <ul style="list-style-type: none"> <li>(i) characteristics of soaps and detergents</li> <li>(ii) detergent bases</li> <li>(iii) organic solids (greases)</li> <li>(iv) synthetic rubber</li> </ul> </li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 2: Garbage Disposal Units

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing domestic garbage disposal units	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:<ul style="list-style-type: none"><li>(i) type</li><li>(ii) size</li></ul></li><li>(b) Types, function and characteristics of domestic garbage disposal units</li><li>(c) Importance of adherence to relevant codes in the selection and installation of domestic garbage disposal units</li><li>(d) Effects of garbage disposal raw wastes on the efficiency of private sewage disposal systems</li><li>(e) Procedures for connecting unit to:<ul style="list-style-type: none"><li>(i) waste pipe</li><li>(ii) sink outlet</li><li>(iii) power source</li></ul></li><li>(f) Consideration of connection of garbage disposal waste pipe to:<ul style="list-style-type: none"><li>(i) main stack or drainage line</li><li>(ii) waste pipe of adjacent fixture</li></ul></li><li>(g) Mathematics:<ul style="list-style-type: none"><li>linear measurements to determine length of waste pipe</li></ul></li><li>(h) Science:<ul style="list-style-type: none"><li>bacteria in food and septic tanks</li></ul></li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 3: Hot Water Storage Tanks

OPERATIONS	KNOWLEDGE
1. Installing hot water storage tanks	<ul style="list-style-type: none"> <li>(a) Interpretation of drawings, specifications, relevant codes and handbooks or charts to determine:               <ul style="list-style-type: none"> <li>(i) location and roughing-in dimensions</li> <li>(ii) type and size</li> <li>(iii) capacity</li> <li>(iv) installation procedures</li> </ul> </li> <li>(b) Importance of adherence to relevant electrical, plumbing and gas or oil burner codes in installing and maintaining hot water storage tanks</li> <li>(c) Types, function and characteristics of hot water storage tanks:               <ul style="list-style-type: none"> <li>(i) direct heater</li> <li>(ii) indirect heater</li> </ul> </li> <li>(d) Types, purpose and characteristics of integral heating units:               <ul style="list-style-type: none"> <li>(i) electric</li> <li>(ii) gas</li> <li>(iii) oil</li> </ul> </li> <li>(e) Function of the cathode rod, glass lining and stone lining in hot water storage tanks</li> <li>(f) Importance and methods of insulating hot water storage tanks</li> <li>(g) Methods of installing control valve in supply line</li> <li>(h) Types, function and characteristics of pressure and temperature relief valves</li> <li>(i) Procedures for locating and installing               <ul style="list-style-type: none"> <li>(i) drain valve</li> <li>(ii) pressure and temperature relief valves</li> </ul> </li> <li>(j) Types, characteristics and method of adjusting thermostatic controls</li> <li>(k) Methods of mounting, supporting or suspending hot water storage tanks</li> <li>(l) Techniques for connecting hot water storage tank to:               <ul style="list-style-type: none"> <li>(i) cold water supply pipe</li> <li>(ii) hot water supply pipes</li> </ul> </li> <li>(m) Importance of correct grading of hot water supply pipes to prevent air-lock</li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12 : Equipment and Appliances

UNIT 3: Hot Water Storage Tanks

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### OPERATIONS

### KNOWLEDGE

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1. Installing hot water storage tanks (Cont'd)

- (n) Importance of air relief when turning on water supply
- (o) Purpose and methods of installing check valve on hot water supply pipe
- (p) Techniques for installing supply piping to prevent syphonage of storage tank
- (q) Considerations in locating hot water storage tanks to minimize reverse flow
- (r) Methods of installing or replacing dip tubes in top supply connection hot water storage tanks
- (s) Importance of avoiding overheating of storage tanks
- (t) Procedures for installing vent flue for self-contained oil or gas heated hot water storage tanks
- (u) Mathematics:
  - (i) linear measurements to determine length and location of supply pipes
  - (ii) formula to calculate hot water tank capacity
- (v) Science:
  - (i) alkalinity and acidity of water
  - (ii) hydrolysis
  - (iii) galvanic corrosion
  - (iv) corrosion of metals
  - (v) characteristics of ferrous and non-ferrous metals
  - (vi) expansion and contraction
  - (vii) pressure and temperature



## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 4: Swimming Pools

OPERATIONS	KNOWLEDGE
1. Installing swimming pool piping systems	<ul style="list-style-type: none"> <li>(a) Interpretation of drawings, specifications and relevant codes to determine:               <ul style="list-style-type: none"> <li>(i) type of system</li> <li>(ii) location and size of piping</li> <li>(iii) type of connections</li> <li>(iv) type and location of balancing tank</li> </ul> </li> <li>(b) Types and characteristics of swimming pools:               <ul style="list-style-type: none"> <li>(i) deck level</li> <li>(ii) gutter</li> </ul> </li> <li>(c) Types, function and characteristics of swimming pool recirculating systems</li> <li>(d) Function and methods of installing:               <ul style="list-style-type: none"> <li>(i) vacuum fittings and cleaning equipment</li> <li>(ii) skimmer fittings and baffles</li> <li>(iii) inlet fittings</li> <li>(iv) main drain</li> <li>(v) deck drains</li> <li>(vi) sight glass (adjacent to pump)</li> </ul> </li> <li>(e) Procedures for installing piping and fittings for:               <ul style="list-style-type: none"> <li>(i) main drain</li> <li>(ii) vacuum lines</li> <li>(iii) pool recirculating lines</li> <li>(iv) filtered water lines</li> <li>(v) skimmers and deck drains</li> </ul> </li> <li>(f) Types, function and characteristics of balancing tanks</li> <li>(g) Methods of installing and connecting balancing tank to water supply piping and recirculating piping</li> <li>(h) Function of main drain in providing gravity outlet to sewer and/or flow back to recirculation system</li> </ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 4: Swimming Pools

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### OPERATIONS

### KNOWLEDGE

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2. Installing swimming pool filters

- (a) Interpretation of drawings, specifications and manufacturers' catalogues and manuals to determine:
  - (i) type
  - (ii) location
  - (iii) capacity
  - (iv) installation procedures
- (b) Types, function and characteristics of swimming pool filters:
  - (i) back wash
    - a. sand
    - b. diatomaceous earth
  - (ii) cartridge
    - a. pressure
    - b. vacuum
  - (iii) combined filter-chlorinator
- (c) Importance of adherence to relevant codes in the selection and installation of swimming pool filters
- (d) Methods of installing and connecting filters to recirculating piping
- (e) Considerations in the selection of filters:
  - (i) pool capacity
  - (ii) pool usage
  - (iii) back-wash interval
  - (iv) filter capacity
  - (v) durability
- (f) Importance of consideration of system pressures or vacuums in selecting cartridge type filters
- (g) Function of influent and effluent pressure gauges and air release valve on filter tank
- (h) Methods of improving filter operation by flocculation with alum or soda-ash
- (i) P.H. conditions influencing the type of flocculating agent
- (j) Importance of selecting filter components of non-corrosive material
- (k) Methods of piping to provide back-wash facilities
- (l) Importance and methods of prevention of back-wash water entering the recirculating system

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 4 : Swimming Pools

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OPERATIONS

KNOWLEDGE

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2. Installing swimming pool  
filters (Cont'd)

- (m) Mathematics:
  - linear measurements to determine location of unit and length of recirculating pipes
- (n) Science:
  - (i) filtration
  - (ii) characteristics of sedimentary materials
  - (iii) precipitation and suspension of solids in liquids
  - (iv) bacteria in water
  - (v) contamination of water
  - (vi) characteristics of:
    - a. sodium hypochloride
    - b. hydrogen sulphide
    - c. iron sulphide
    - d. iron oxide
    - e. iron algae and bacteria
  - (vii) flocculation

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 4: Swimming Pools

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OPERATIONS

KNOWLEDGE

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3. Installing recirculating pumps

- (a) Interpretation of drawings, specifications and manufacturers' catalogues to determine:
  - (i) size and location
  - (ii) type
  - (iii) capacity
- (b) Types, function and characteristics of recirculating pumps
- (c) Methods of calculating pump size and capacity
- (d) Procedures for installing and levelling recirculating pumps
- (e) Importance of selecting pump motor to suit available voltage
- (f) Types, function and methods of installing strainers in recirculating lines
- (g) Mathematics:
  - (i) linear measurement to determine:
    - a. length of recirculating pipes
    - b. location of pump
  - (ii) formula to calculate pump size and capacity

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 4: Swimming Pools

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OPERATIONS	KNOWLEDGE
<hr/>	
4. Installing swimming pool heating units	<ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' catalogues and manuals to determine:<ul style="list-style-type: none"><li>(i) type and size</li><li>(ii) location</li><li>(iii) installation procedures</li></ul></li><li>(b) Types, function and characteristics of swimming pool heating units:<ul style="list-style-type: none"><li>(i) oil</li><li>(ii) gas</li><li>(iii) electric</li><li>(iv) other</li></ul></li><li>(c) Importance of adherence to relevant plumbing, electrical and oil and gas burner codes in the selection and installation of swimming pool heating units</li><li>(d) Considerations in and methods of determining required heater capacity:<ul style="list-style-type: none"><li>(i) pool capacity</li><li>(ii) temperature differential</li><li>(iii) heating period</li></ul></li><li>(e) Procedures for installing heaters in recirculating line</li><li>(f) Purpose and methods of installing bypass connections around heaters</li><li>(g) Types and characteristics of automatic temperature control for heating units</li></ul>



# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT4 : Ornamental Pools and  
Aquariums

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### OPERATIONS

### KNOWLEDGE

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1. Installing water supply  
and recirculating system

- (a) Interpretation of drawings and specifications to determine:
  - (i) size and location of supply and recirculating piping
  - (ii) size and location of recirculating pump
  - (iii) location of balancing tank
- (b) Types, function and characteristics of ornamental pool and aquarium installations
- (c) Importance of adherence to relevant codes in the installation of pool supply and recirculating systems
- (d) Procedures for installing water supply piping and recirculating piping
- (e) Importance and methods of installing control valve on supply line
- (f) Techniques for protecting water supply against back-syphonage
- (g) Conditions contributing to and methods of controlling condensation on cold water supply
- (h) Techniques for providing automatic water supply for pools
- (i) Procedures for the installation of balancing tanks
- (j) Types, function and characteristics of recirculating pumps
- (k) Methods of installing pumps and connecting to recirculating system
- (l) Importance and methods of installing screen or filter fitting between pool and pump
- (m) Importance of installing flexible joint at pump connections
- (n) Technique of returning water to pool:
  - (i) spray heads
  - (ii) nozzles
  - (iii) ornamental fittings

AN ANALYSIS OF THE PLUMBING TRADE

- FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 4: Ornamental Pools and  
Aquariums

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OPERATIONS	KNOWLEDGE
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2. Installing waste system	<ul style="list-style-type: none"><li>(a) Interpretation of drawings and specifications to determine waste roughing-in dimensions</li><li>(b) Methods of retaining water in pool:<ul style="list-style-type: none"><li>(i) standing waste and overflow</li><li>(ii) overflow weir</li><li>(iii) removable plug</li></ul></li><li>(c) Procedures for installing waste piping by connecting to:<ul style="list-style-type: none"><li>(i) sanitary drain</li><li>(ii) storm drain</li><li>(iii) other disposal points</li></ul></li><li>(d) Methods of locating and installing main drain valve</li><li>(e) Techniques of preventing entry of solids into waste pipe:<ul style="list-style-type: none"><li>(i) hooded overflow</li><li>(ii) screened overflow outlet</li></ul></li><li>(f) Considerations in connecting waste to a sanitary drain</li><li>(g) Identification of conditions requiring the use of a back-water valve</li><li>(h) Methods of providing leak-proof conditions where pipes pass through walls of pools</li><li>(i) Importance of use of a metal safe or pan under interior pools</li><li>(j) Importance of use of non-ferrous metals in pool connections</li></ul>

# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING -

BLOCK 12: Equipment and Appliances

UNIT 6: Commercial and Institutional Equipment

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### OPERATIONS

### KNOWLEDGE

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| 1. Installing and servicing commercial and institutional equipment | <ul style="list-style-type: none"><li>(a) Interpretation of drawings, specifications and manufacturers' manuals to determine:<ul style="list-style-type: none"><li>(i) type and size</li><li>(ii) roughing-in dimensions</li><li>(iii) installation procedure</li></ul></li><li>(b) Importance of adherence to relevant plumbing codes and health unit regulations in installing commercial and institutional kitchen equipment</li><li>(c) Types, function and characteristics of commercial and institutional kitchen equipment:<ul style="list-style-type: none"><li>(i) potato peelers</li><li>(ii) coffee urns</li><li>(iii) refrigerators</li><li>(iv) water dispensers</li><li>(v) water coolers</li><li>(vi) steam kettles</li><li>(vii) bain maries</li><li>(viii) steam tables</li></ul></li><li>(d) Types, functions and characteristics of hospital and laboratory equipment:<ul style="list-style-type: none"><li>(i) service sinks</li><li>(ii) flushing rim sinks</li><li>(iii) laboratory tables</li><li>(iv) elongated toilet bowls<ul style="list-style-type: none"><li>(i) bed pan hose</li><li>(ii) spray attachments</li></ul></li><li>(v) sterilizing equipment</li><li>(vi) anesthetic gas lines</li><li>(vii) oxygen lines and equipment</li><li>(viii) suction lines</li><li>(ix) water compressed air lines</li><li>(x) physiotherapy equipment</li></ul></li><li>(e) Techniques of installing and levelling free standing equipment</li><li>(f) Methods of connecting supply piping to equipment</li><li>(g) Importance and procedures for installing supply piping control valves</li></ul> |
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# AN ANALYSIS OF THE PLUMBING TRADE

## - FIXTURE AND EQUIPMENT INSTALLATION AND SERVICING

BLOCK 12: Equipment and Appliances

UNIT 6 Commercial and Institutional  
Equipment

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OPERATIONS	KNOWLEDGE
<hr/>	
1. Installing and servicing commercial and institutional equipment (Cont'd)	(h) Importance of provision for disconnecting supply for repair and/or servicing (i) Methods of installing waste piping and/or traps for primary and secondary waste traps (j) Importance of provision of access cleanouts in waste lines (k) Importance and methods of installing grease interceptors where applicable (l) Methods of removing and/or servicing grease interceptors (m) Procedures for clearing stoppages in waste pipes and traps.









E.M. 22-9-67



